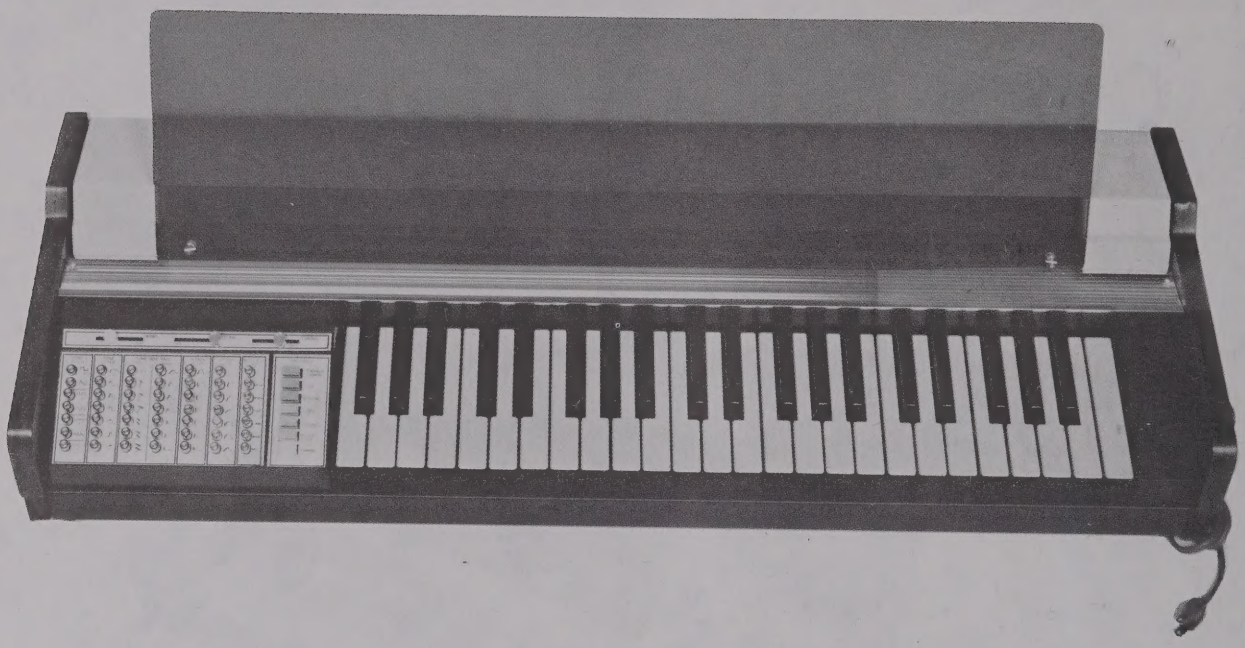
SERVICE MANUAL

SYNTHESIZER - 102100

HO 1291 1074

HAMMOND ORGAN COMPANY
DIVISION OF HAMMOND CORPORATION
11700 Copenhagen Court • Franklin Park, Ill. 60131
312—766-6950



SYNTHESIZER - 102100

Cabinet Size - 36" Wide, 13½" Deep, 13" High with Music Panel

Weight: 37 lbs.

Power Input: 120 Volts, 60 HZ, .2 Amps.

TABLE OF CONTENTS

SECTION I - HOW THE SYNTHESIZER - 102100 OPERATES

PAGE

1- 1 General 1- 1
1- 2 Synthesizer Output 1- 1
1- 3 Buttons & Preset End Block Assembly 1- 1
1- 4 Triggering Modes 1- 1
1- 5 Wind Slider. 1- 2
1- 6 Volume Slider. 1- 2
1- 7 Tuning Slider. 1- 2
1- 8 Tone Pitch 1- 2
1- 9 Tone Filter 1- 2
1-10 Tone Filter Rise & Fall (Width & Speed). 1- 2
1-11 Attack and Decay 1- 3
1-12 Pitch Slide 1- 3
1-13 Modulator (Vibrato). 1- 3
1-14 Presets 1- 3

SECTION II - DISASSEMBLY AND MAINTENANCE

ILLUSTRATIONS - FIGURE 2-1 THRU 2-4 . . . . . 2- A

2- 1 General 2- 1
2- 2 Removal of Music Panel 2- 1
2- 3 To Gain Access Into Synthesizer Assembly 2- 1
2- 4 Removal of Printed Wiring Board In Back Of Manual. 2- 1
2- 5 To Remove Fuse or Access To A.C. Fuse Block. 2- 1
2- 6 To Gain Access Under Manual And End Block Assembly 2- 1
2- 7 To Remove Large Printed Wiring Board Under Manual 2- 2
2- 8 To Remove End Block Button And Preset Assembly 2- 2
2- 9 To Remove Slide Potentiometer Assembly 2- 2
2-10 To Remove or Replace Manual Keys 2- 2
2-11 For Reassembly 2- 2
2-12 Key Replacement. 2- 3
2-13 Test and Adjustment Procedure. 2- 4
Test and Adjustment Procedure. 2- 5
Test and Adjustment Procedure. 2- 6
Test and Adjustment Procedure. 2- 7
2-14 Potentiometer Locations (Figure 2-8A and 2-8B) 2- 8
2-15 Plug and Connector Identification. 2- 9
2-16 Maintenance (Cleaning Woodwork and Metal Finishes, and Service Information). 2-10
2-17 Synthesizer Panel (Illustration) 2-11
2-18 Buttons and Preset Description Chart 2-11

SECTION III - DIAGRAMS AND TEXT

3- 1 General and List of Illustrations. 3- 1

SECTION IV - ILLUSTRATED PARTS LIST

4- 1 Index (Parts List) 4- 1

Appendix (Not Included At This Time)
Appendix Index . . . . . A- 1

LIST OF ILLUSTRATIONS

SYNTHESIZER – 102100

Figure				Page
	General and List of Illustrations			3- 1
3- 1	Synthesizer Logic Diagram			3- 2
3- 2	Point to Point Wiring Diagram			3- 3
3- 3	Hi-Select Board - Layout and Theory	(124-000389)	1	3- 4
3- 4	Hi-Select Board Schematic	(124-000389)	1	3- 5
3- 5	Octave Generator Board - Schematic, Layout and Theory	(124-000390)	2	3- 6
3- 6	Note Generator Board - Schematic, Layout and Theory	(124-000391)	3	3- 7
3- 7	Pitch Modulator Board Layout and Theory	(124-000393)	4	3- 8
3- 8	Pitch Modulator Board - Schematic	(124-000393)	4	3- 9
3- 9	Filter Board - Schematic, Layout and Theory	(124-000394)	5	3-10
3-10	Legato Pulse Board - Schematic, Layout and Theory	(124-000395)	6	3-11
3-11	Keyer Board - Schematic, Layout and Theory	(124-000396)	7	3-12
3-12	Power Supply Board - Schematic, Layout and Theory	(124-000392)	8	3-13
3-13	Preset and Switch Boards, Layouts	(124-000397 thru 124-000404)	9 - 16	3-14
3-14	Switch Boards - Schematic's	(124-000397 thru 124-000403)	9 - 15	3-15
3-15	Synthesizer Flow Block Diagram			3-16

SECTION I
HOW THE INSTRUMENT OPERATES

SYNTHESIZER - 102100

I-1 GENERAL --

This section briefly describes various features and functions of the Synthesizer Unit. This is a Monophonic, High Note Select Instrument. It is a self contained, 44 note keyboard with an End Block Assembly containing control buttons and presets, and also an internal power supply. A 1/4" phone jack provides the units means for connecting to organ or Guitar-type amplifier speaker systems.

The Synthesizer is comprised of the following features.

I-2 SYNTHESIZER OUTPUT --

The electrical output of the Synthesizer which connects to an organ pre-amp or a separate Guitar type amplifier is variable by means of a screw driver adjustment above the output jack from about 100 MV to 1 RMS at about 10 K Ohms

The Accessory unit output is available at the 1/4" phone jack. This output may also be suitable for headphones (8 OHM) for private listening.

I-3 BUTTONS & PRESET END BLOCK ASSEMBLY --

The buttons in each vertical row are inter-latched. Pressing one releases any other which might be latched down. Two or more may be latched down if they are pressed and carefully released simultaneously. None of the buttons are push-on/push off.

The spaces between the control buttons leave little room for descriptive identifications so a system of

I-3 BUTTONS & PRESET END BLOCK ASSEMBLY -- (CONTINUED)

graphics appear. Although technical, they will enable the player to quickly identify his choosing of buttons. See "Buttons and Preset Description Chart" for some further information and button functions.
Figure 2-11B, Page 2-11.

I-4 TRIGGERING MODES --

Several modes of key-down sensing are used for operating unitary circuits such as; attack, percussion, delayed vibrato, slides and sweeps, etc. They are:

(a) Touch-Response Mode - Which requires detatched playing for retriggering.

(b) Delta-High Note Mode - This mode senses whenever the highest note changes. It will trigger upon the release of, as well as, depressing of a top key.

(c) Sostenuto Mode (Button 3 of the Attack/Decay Row) - In this Mode, a tone is triggered on by the first key pressed and remains on at full level until another key is pressed, at which time the tone will change to the new pitch keyed and will continue to sound until another button is selected, or the power is shut off. Restoring power finds the gate closed, awaiting a new first key depressing. One purpose of Sosenuto Mode is to permit continuous sounding of a tone or wind or both while both hands are free to play another manual.

I-5 WIND SLIDER --

White noise is controlled by the Wind Slider from Silence to Maximum, with a tapered uniform loudness change. The loudness of Wind heard, (depending on the position of this slider) is not altered by operating the presets, thus the amount of Wind desired must be separately adjusted for each preset. The Wind is affected by the attack/decay,tone filter, filter speed and filter width rows of buttons.

I-6 VOLUME SLIDER --

The term volume refers to all the sounds except the Wind. This output is controlled by the volume slider from Silence to maximum loudness in a linear fashion.

To hear Wind without the musical tone, this slider is moved to off. The volume slider is also not affected by presets. Whatever amplification system used, the maximum gain of the system should be so set that the volume slider will be near maximum for most musical utility. This will minimize problems of background noises and gating transients.

I-7 TUNING SLIDER --

This control shifts the pitch linearly, about one semitone above and two semitones below nominal pitch so the player can match, or purposely mismatch the organ or another instrument. (A wider range adjustment is inside the Chassis - See "Test and Adjustment procedure", Step #2, Page 2-4). Position 1/3 down from maximum is normal. This slider may need to be adjusted each time the instrument is turned on. The presets do not affect this slider.

Tuning should be adjusted using a Synthesizer setting of 5 111 111 and (if organ) an 8' tone on the organ upper manual. This setting selects the 8' pitch and eliminates all the characteristics that confuse the tuning.

I-8 TONE PITCH --

This row selects the pitches and wave shapes as shown in "Buttons and Preset Description Chart", Figure 2-11B, Page 2-11. These seven tone sources are decoupled so that two or more may be used together without excessive loss or build up of loudness.

I-9 TONE FILTER --

This row of buttons selects or adds more tonal variety to create more authentic instrumental imitations. It selects the at-rest position of the voltage controlled (Band Pass) filter (V.C.F.) and an all-pass, full tone position. Some of these filter positions also bring in very small capacitors to limit the low frequences. The at-rest resonance and capacitors are on the "Buttons Preset Description Chart", Figure 2-11B, Page 2-11.

I-10 TONE FILTERS RISE AND FALL (WIDTH AND SPEED) --

These two rows of buttons select the Modes of shifting the V.C.F. up and back down. The tone filter row must be on; 2,3,4,5,6 or 7 for the rise and fall to operate. The Width row selects the amount of Breadth or excursion of sweep (3 amounts) as well as the mode (one shot or repeating) and off. The amounts are approximately 1/4, 1/2 and maximum shift of about two octaves.

Buttons 2, 3 and 4 cause a one shot rise and fall while 5, 6 and 7 cause a repeating rise and fall. The rise and fall times for both modes, selected by the speed row as well as the trigger modes are shown on the "Buttons & Preset Description Chart on Figure 2-11B, Page 2-11.

1-11 ATTACK AND DECAY --

This row of buttons select a variety of attack and decay envelope combinations. All seven envelopes and trigger modes are listed on the Chart.

1-12 PITCH SLIDE --

This row of buttons select three speeds of pitch slide. Buttons 2, 3 and 4 slur, slide or Portamento up to the key played. Repeating the same key should result in an up slide.

Buttons 5, 6 and 7 have three speeds of slide up and down between keys played. Repeating the same key should result in NO up or down slide. The slide times, and the trigger mode, are shown on the "Buttons & Preset Description Chart, Figure 2-11B, Page 2-11.

1-13 MODULATOR (VIBRATO) --

This row of buttons offer six variations of speeds and widths of frequency modulation (Vibrato). This shift is triangular (constant percentage rate of frequency change, up and down) and symetrical. The

1-13 MODULATOR (VIBRATO) CONTINUED --

oscillator is running all the time at the selected speed and not gated on by the keys. Buttons 4 and 5 are the delayed vibrato mode only. All the modulation rates, widths, and trigger modes are on the "Buttons & Preset Description Chart, Figure 2-11B, Page 2-11.

1-14 PRESETS --

The presets are to be used one at a time, electrically they disregard all the button settings and engage a factory chosen setting. Depress-a preset will not affect the amount of Wind selected by its slider or altar the tone volume or tuning sliders. But these three sliders do affect the presets just as they do the button settings.

The "Buttons & Preset Description Chart", Figure 2-11B, Page 2-11 shows in number groups, the equivalent buttons preset in each row.

The cancel tab restores button panel operation.

For reference of wave forms and frequency curves use the "Button & Preset Description Chart", Figure 2-11B, Page 2-11.

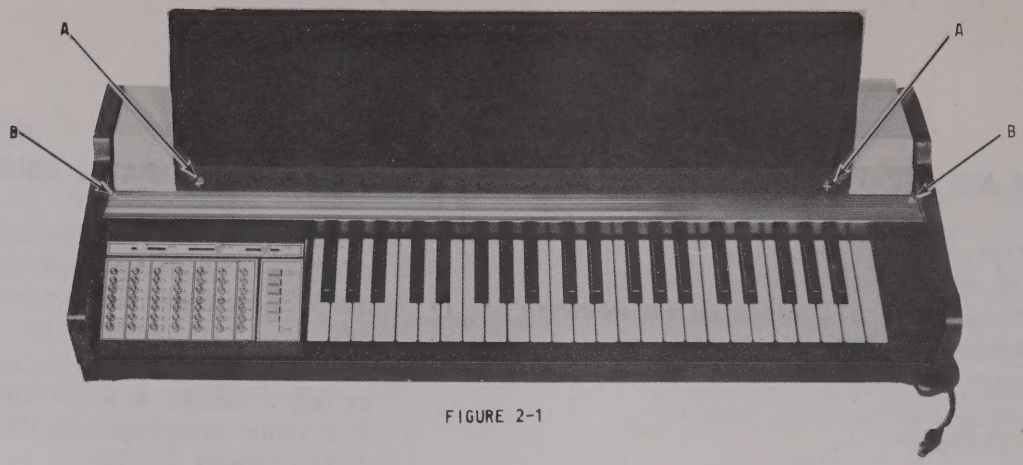


FIGURE 2-1

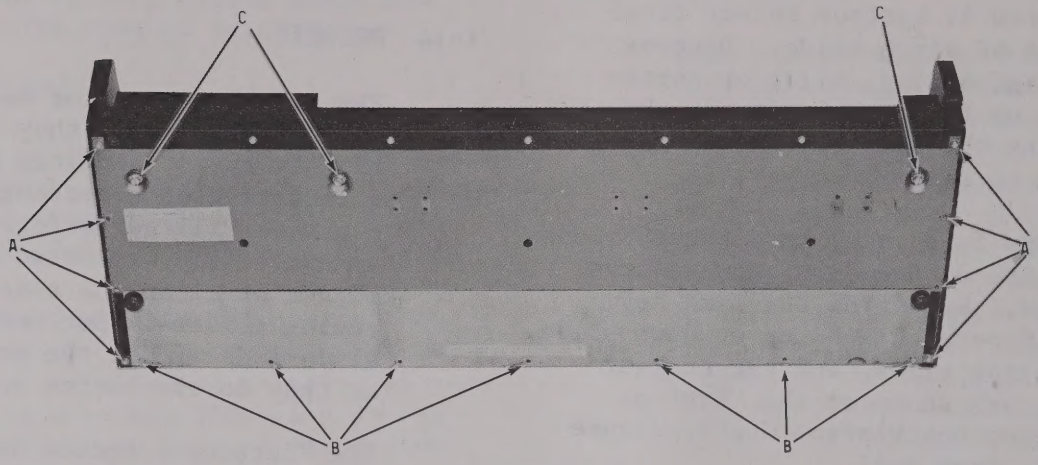


FIGURE 2-2

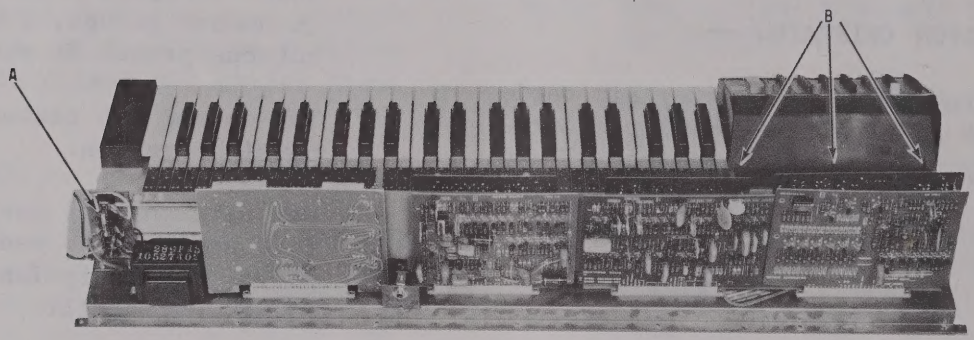


FIGURE 2-3

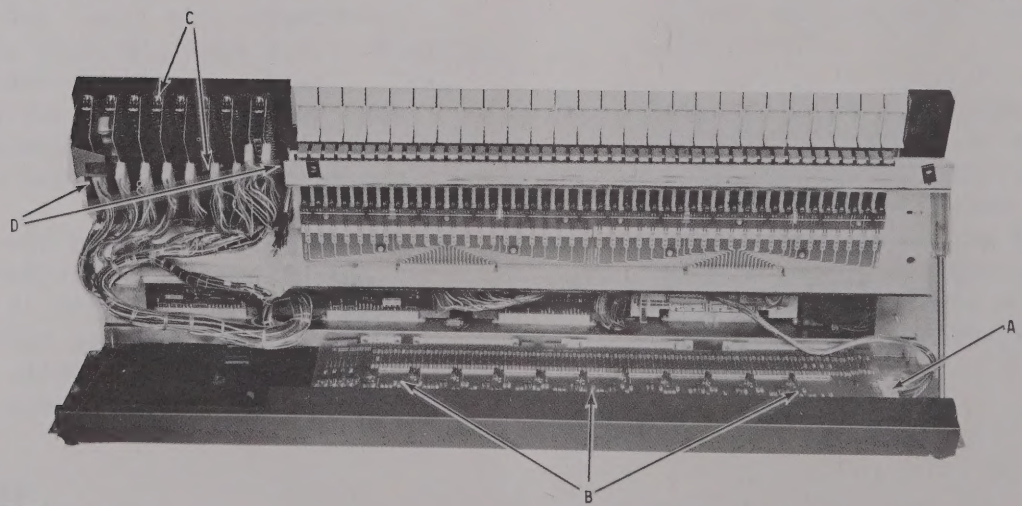


FIGURE 2-4

SECTION II
DISASSEMBLY AND MAINTENANCE

SYNTHESIZER - 102100

DISASSEMBLY

2-1 GENERAL - This section describes a main disassembly sequence and procedure for removal of any specific assembly. It is layed out in sequence, and to reassemble, reverse procedure. The removal of some Sub-Assemblies are obvious and will not be discussed.

2-2 REMOVAL OF MUSIC PANEL -

(a) Remove two (2) large Decorative round head screws located at each end near the bottom of the music panel. SEE A-FIGURE 2-1

(b) Lift panel off, care must be taken to avoid scratching or marring glass like panel.

2-3 TO GAIN ACCESS INTO SYNTHESIZER ASSEMBLY (WOOD SIDE PANELS AND FORMED METAL TOP AND BACK COVER MUST BE REMOVED).

(a) From the front top of the Synthesizer, locate and remove two (2) phillips head screws at each end of music rack. SEE B-FIGURE 2-1

(b) Carefully turn Synthesizer over and rest on top cover.

(c) Remove four (4) hex head screws (each side panel) holding wood panels to bottom of Synthesizer base. SEE A-FIGURE 2-2

(d) Remove side panels - care must be taken to avoid scratching or damaging panels.

(e) For removal of formed metal top and back cover, remove seven (7) hex screws across bottom rear edge of base. SEE B-FIGURE 2-2

(f) Holding cover from falling, turn Synthesizer over to a normal playing position. Lift cover back carefully, avoid strain on leads to A.C. switch still attached to cover.
(To reassemble, reverse procedure. Care must be taken to avoid pinching A.C. wires from line switch or transformer when replacing back cover).

2-4 REMOVAL OF PRINTED WIRING BOARD IN BACK OF MANUAL

(a) All boards are plug in type and lift straight up from connectors.

2-5 TO REMOVE FUSE OR ACCESS TO A.C. FUSE BLOCK -

(a) Fuse and Fuse Block is located at the far right, and behind Manual. Paperlike cover must be unfastened at the center and spread apart to gain access to fuse. SEE LOCATION A-FIGURE 2-3

2-6 TO GAIN ACCESS UNDER MANUAL (KEYBOARD) AND END BLOCK ASSEMBLY.

(a) Carefully tip-up front of Synthesizer far enough to locate and remove three (3) large (¼") hex bolts from bottom of base of Synthesizer. CAUTION: When removing these bolts, with one hand,hold manual to base to avoid manual from falling backwards and causing damage to assembly. SEE C-FIGURE 2-2

(b) Set down manual and base to normal playing position. By placing hands under manual frame (not under keys) and end block, swing-up manual from base assem-

bly. Prop-up manual from base by using a screw driver or similar item, avoid damaging any boards or parts.

2-7 TO REMOVE THE LARGE PRINTED WIRING BOARD UNDER MANUAL (124-000389 HI-SELECT BOARD).

(a) Unplug connector at far right of board. SEE A-FIGURE 2-4

(b) Release board from plastic clips by depressing top edge of clips and lift board just enough to clear. SEE B-FIGURE 2-4

(c) Lift board slightly to clear clips and pull toward front of unit to unplug from rear connectors.

(d) Carefully lift rear of board up and out of unit.

2-8 TO REMOVE END BLOCK BUTTON AND PRE-SET ASSEMBLY.

(a) From rear bottom of End Block, mounting End Block to frame assembly, remove three (3) hex head screws. SEE B-FIGURE 2-3

(b) Carefully slide Button End Block Assembly to the left far enough to clear right hand bracket from manual frame assembly. Lift and carefully place End Block Assembly along side of Synthesizer. It will be attached to the main unit by cable connections. To completely remove from main unit unplug all board cable connectors.

(c) To remove any one board from End Block Assembly unplug the cable connectors and remove small hex head screws from each end of Button Switch Board assembly. SEE C-FIGURE 2-4

2-9 TO REMOVE SLIDE POTENTIOMETER ASSEMBLY

(a) With End Block Assembly turned over, locate slide potentiometer assembly. Remove two small hex screws each end of slide potentiometer bracket. SEE D-FIGURE 2-4

(b) Unplug cable connections and remove assembly.

(c) Slide potentiometers are mounted to the slide bracket by twist tabs on each end of the potentiometers. To remove a defective potentiometer, unsolder cable leads, straighten tabs and remove potentiometer from bracket. Install new potentiometer in bracket, twist tabs to secure to bracket and resolder cable leads.

2-10 TO REMOVE OR REPLACE MANUAL KEYS

(a) Follow procedure as outlined in 2-12 "Key Replacement".

2-11 FOR REASSEMBLY - Use procedure in reverse sequence. Care must be taken to avoid pinching any cables when reassembling top and back cover to Synthesizer base. Also carefully place top cover over printed wiring boards, avoid damage.

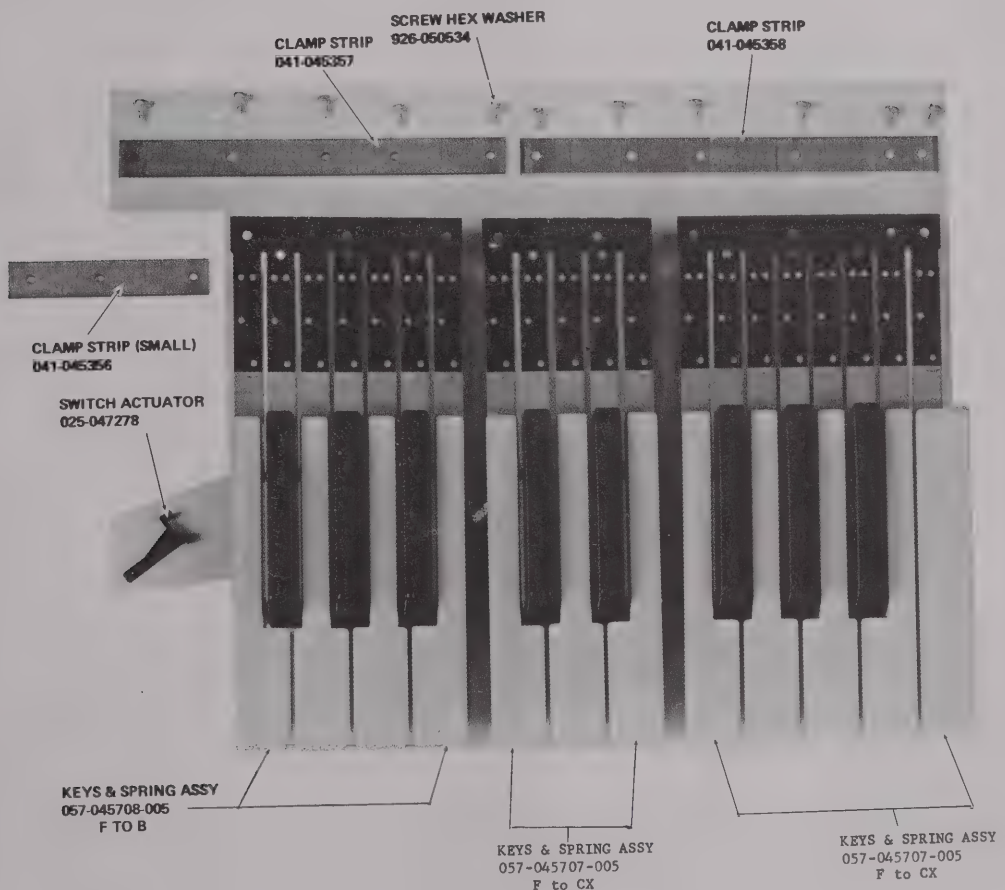
2-12 KEY REPLACEMENT – (PERFORM STEPS AS INDICATED IN PARAGRAPHS 2-2 AND 2-3 FIRST)

(a) The manual keys cannot be replaced individually. Key module or key section will be replaced. See "Key and Spring Assemblies" illustration to determine which module or section is to be used.

(b) Determine which module is to be replaced. Remove screws and clampling strip associated with defective module.

(c) Lift rear of module and carefully push forward separating actuator from contacts.

(d) Replace with new module and reassemble in reverse procedure. Care must be taken when aligning actuators with contacts. View underside of keyboard during installation to avoid damage to contacts.



1. The following conditions and setting should be maintained except where other specific instructions are given.

2. All tests are measured at output jack, except where other specific instruction are given.

3. Tone slide potentiometer to maximum.
   Wind slide potentiometer at minimum.
   Tuning control mid range (after final tuning procedure, tuning potentiometer should not be moved).
   Button #1 depressed in each column, except button #7 in preset column.
   Potentiometer-Rear, above output jack, to maximum.

STEP	TEST AND TEST POINT	DEPRESS BUTTON OR MOVE SLIDER	PLAY KEYS	ADJUST	OSCILLATOR	FIG.
1. (a)	TONE PITCH TEST Measure at Output Jack	(a) Attack/Decay Button	(a) Highest Key	(a) R-38 Level Adj. (124-000396)	(a) Adjust to Maximum	2-8 (B)
(b)	PERFORM THE FOLLOWING TEST					
		Depress - Tone Pitch Button		Observe Wave at Output	Minimum P/P Output / Maximum P/P Output	
		#1			1.0 Volt / 2.0 Volts	
		#2			1.0 Volt / 2.0 Volts	
		#3			.8 Volt / 1.7 Volts	
		#4			1.0 Volt / 2.0 Volts	
		#5			.8 Volt / 1.7 Volts	
		#6			.7 Volt / 1.4 Volts	
		#7			.7 Volt / 1.4 Volts	
2.	TUNING					
(a)	Measure at Output Jack	(a) Tuning Slide Potentiometer extreme Right. Attack/Decay Button #3. Tone Pitch Button #5.	(a) Depress Second "A" Key From Left of Manual	(a) R-56-Tuning Potentiometer (124-000393)	(a) 466 HZ	2-8 (A)
(b)	Measure at Output Jack	(b) Tuning Slide Potentiometer to Extreme Left	(b) Same as Step 2-(a)		(b) 395 HZ	

STEP	TEST AND TEST POINT	DEPRESS BUTTON OR MOVE SLIDER	PLAY KEYS	ADJUST	OSCILLATOR	FIG.
(c)	Measure at Output Jack	(c) Adjust Tuning Slide-Potentiometer			(c) for 440 HZ Do not readjust after this setting	
3.	NULL BALANCE AND LEVEL ADJUST					
(a,b)	Measure at Output Jack			(a) R-38 Level Adj. (124-000396)	(a) To Maximum	2-8 (B)
		(b) Release all Tone Pitch Buttons	(b) Repeatedly Tap Any Key	(b) R-44 Null Adj. (124-000396)	(b) Observe Output Wave Form and Adjust for Minimum Amplitude of Wave Form	2-8 (B)
4.	ATTACK/DECAY ENVELOPES					
(a)	Measure	(a) Depress Each Attack/Decay Button (one at a time)	(a) Play a Manual Key for Each Button Position		(a) Observe Each Envelope That it Conforms to that Shown on the Switch Legend	
5.	VIBRATO					
(a,b)	Connect Scope and Counter to Top (Positive End) of C10 124-000393 Board	(a) Depress-Vibrato Button #2	(a)	(a) R-91 Vibrato Freq. Set (124-000393)	(a) Adjust if Necessary to 170 ms (5.8) on Triangular Waveform	2-8 (A)
			(b)	(b) R-67-Zero Set (124-000393)	(b) Check That Waveform is Centered Around Ground Adj. if Necessary	2-8 (A)
(c)	Connect scope and counter to terminal #3 on 124-000393 board (which is the the collector for Q-17)		(c)	(c) R-52-Vibrato Adj. (124-000393)	(c) Triangular Waveform should Measure 170 mv P/P Adjust if Necessary	2-8 (A)
(d)	Listening test	(d) Depress Vibrato Buttons 3 Thru 7 Successively	(d) While Playing Manual Keys	NOTE: Buttons 2 and 4 Produce Identical Frequency and Amplitude, With Button 4 Being Delayed. Buttons 3 and 5 also are Identical, Except That Button 5 is Delayed. Buttons 3 and 5 Produce a Vibrato of Higher Amplitude and Faster Speed (6.8 HZ) Than Buttons 2 and 4. Button 6 Produces a Still Higher Amplitude, With an Increase in Frequency.		
6.	PITCH SLIDE (Up-Slide)					
(a,b,c)	Listening Test	(a) Depress Pitch Slide Button #2	(a) Play Several Manual Keys	(a) NOTE: Very Rapid Pitch Slide up to Note. Note should Never Down Slide. Repeating Same Note should Result in Repeated up Slide.		

STEP	TEST AND TEST POINT	DEPRESS BUTTON OR MOVE SLIDER	PLAY KEYS	ADJUST	OSCILLATOR	FIG.
		(b) Pitch Slide Button #3.	(b) Play Several Manual Keys	(b) NOTE: Longer Duration of up Slide.		
		(c) Pitch Slide Button #4	(c) As Above	(c) NOTE: Observe Still Longer up Slide.		
7.	PITCH SLIDE (Up/Down Slide)					
(a,b, c,d)	Listening Test	(a) Pitch Slide Button #5	(a) Alternately Play two Manual Keys	(a) NOTE: Very Fast Pitch Slide up From Lower Key to Higher Key, and Down Slide From Higher Key to Lower Key.		
		(b) Same as Step 7(a)	(b) Repeat Same Key		(b) No Slide Should Occur	
		(c) Pitch Slide Button #7	(c) Same as Steps 7(a & b)	(c) NOTE: Longer Slide Duration		
		(d) Pitch Slide Button #6	(d) Same As Steps 7(a & b)	(d) NOTE: A Still Longer Duration		
8.	FILTER BOARD ADJUSTMENTS					
(a)	Measure at Output Jack	(a) Depress Tone Pitch Button #5. Tone Filter Button #2	(a) Depress First "A" Note From Left of Manual	(a) R-49 Sweep Width (124-000394)	(a) (220 HZ) Adjust for Maximum Sine Wave Output.	2-8 (A)
(b)		(b) Tone Pitch Button #7 Tone Filter Button #6	(b) Depress Highest "B" Note	(b) R-57-Bias Control (124-000394)	(b) (3951 HZ) Adjust for Maximum Sine Wave Output.	2-8 (A)
(c)		(c) Repeat Steps (a) & (b) Until Both Settings Produce Maximum Sine Wave Outputs Without further Adjustments After Switching Between Settings. (The Final Adjustment Must Always be made at 220 HZ and Adjusting R-49 on the 124-000394 Board				2-8 (A)
(d)		(d) Depress Seccessively Tone Filter Buttons 3 Through 7 While Playing Manual Keys. Note that the Filter Resonant Point Becomes Higher With Each Successive Button.				
9.	FILTER SWEEP					
(a)	Measure at Output Jack	(a) Depress - Speed Button #5 Tone Filter Button #2	(a) NOTE: Depress Successively Width Buttons 2, 3, and 4, as a Key is Played the Filter is Swept Once and Only Once, and That With Each Successive Width Button the Sweep Becomes Wider.			
(b)		(b) As in Step 9-a	(b) NOTE: Depress Successively Width Buttons 5, 6, and 7. Observe that the Filter is Swept Continuously While the Key is Held Down, and That with Each Successive Width Button the Sweep Becomes Wider.			
(c)		(c) Depress Width Button 7 Tone Filter Button 2 Attack/Decay Button 3	(c) Play Note Near the Middle of the Manual	(c) NOTE: Successively Depress Speed Buttons 1 through 7. Observe That the Rise and Fall Times of the Sweep Vary in Accordance with the Switch Legend.		

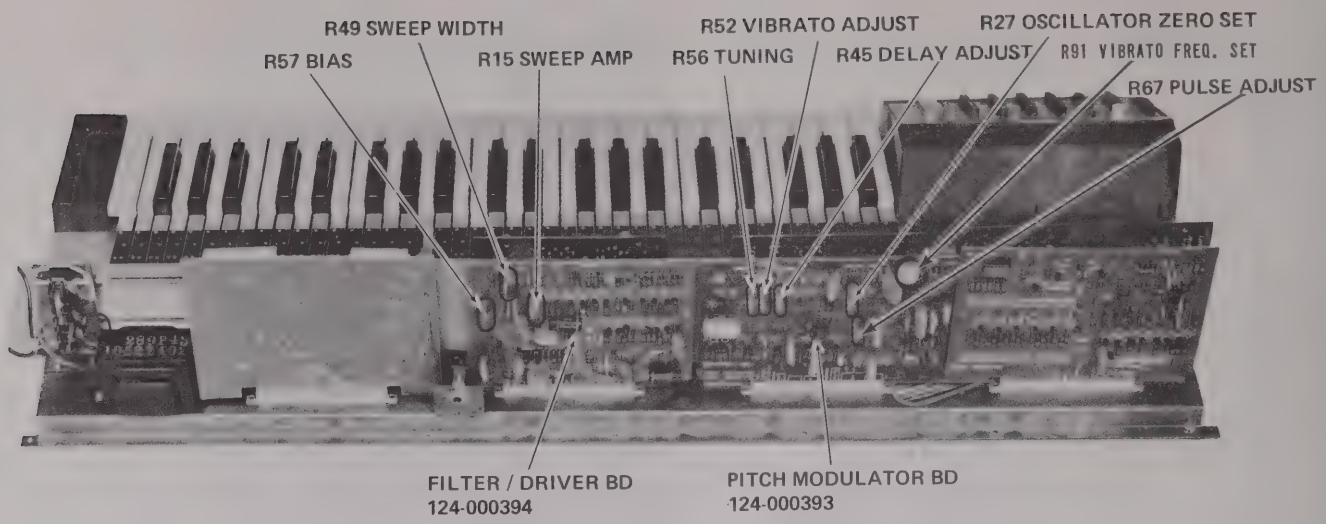
STEP	TEST AND TEST POINT	DEPRESS BUTTON OR MOVE SLIDER	PLAY KEYS	ADJUST	OSCILLATOR	FIG.
10.	PRESET VOICES					
	Listening Test	(a) For Each Preset Voice, Set-up Selector Buttons as Indicated in Table (b) Alternate Between Preset Button 7 (Cancel) and the Appropriate Preset Voice Button While Playing the Manual, Observe No Change in the Character of the Notes Produced.				

PRESET REGISTRATIONS

PRESET VOICE	TP	TF	TONE WD	RISE-FALL SP	AD	PS	VIB
French Horn	4	3	1	1	1	2	7
Tuba	2	2	1	1	1	2	7
Violin	6	1	1	1	1	5	5
Sax	4	6	1	1	1	2	4
Clarinet	3	5	1	1	1	1	1
Solar Echo	6	5	7	3	4	1	7

TF = Tone Filter WD = Width AD = Attack/Decay
TP = Tone Pitch SP = Speed PS = Pitch Slide VIB = Vibrato

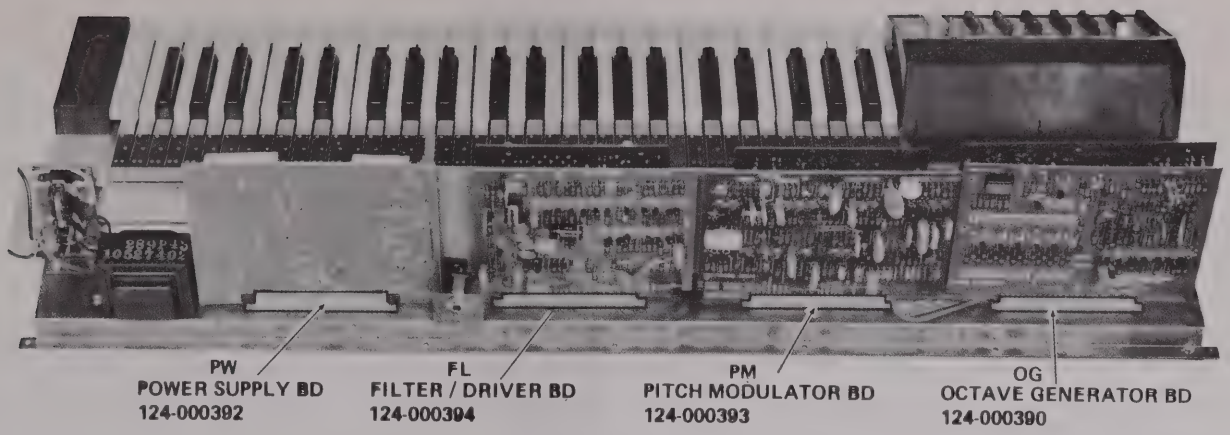
11.	WIND LEVEL ADJUSTMENT					
(a)	Measure at Output Jack	(a) Wind Slide Potentiometer to Maximum Tone Slide Potentiometer to Minimum Depress Attack/Decay Button 3	(a) Depress and Release any Manual Key	(a) R-28 Wind Adj. (124-000396)	(a) 2 Volts P/P	2-8 (B)
12.	NOISE AND HUM LEVEL					
(a)	Measure at Output Jack	(a) Release All Tone Pitch Buttons Depress Attack/Decay Button 3	(a) Depress and Release Manual Key		(a) Noise and Hum Level Should Be Less Than 6 M.V.	



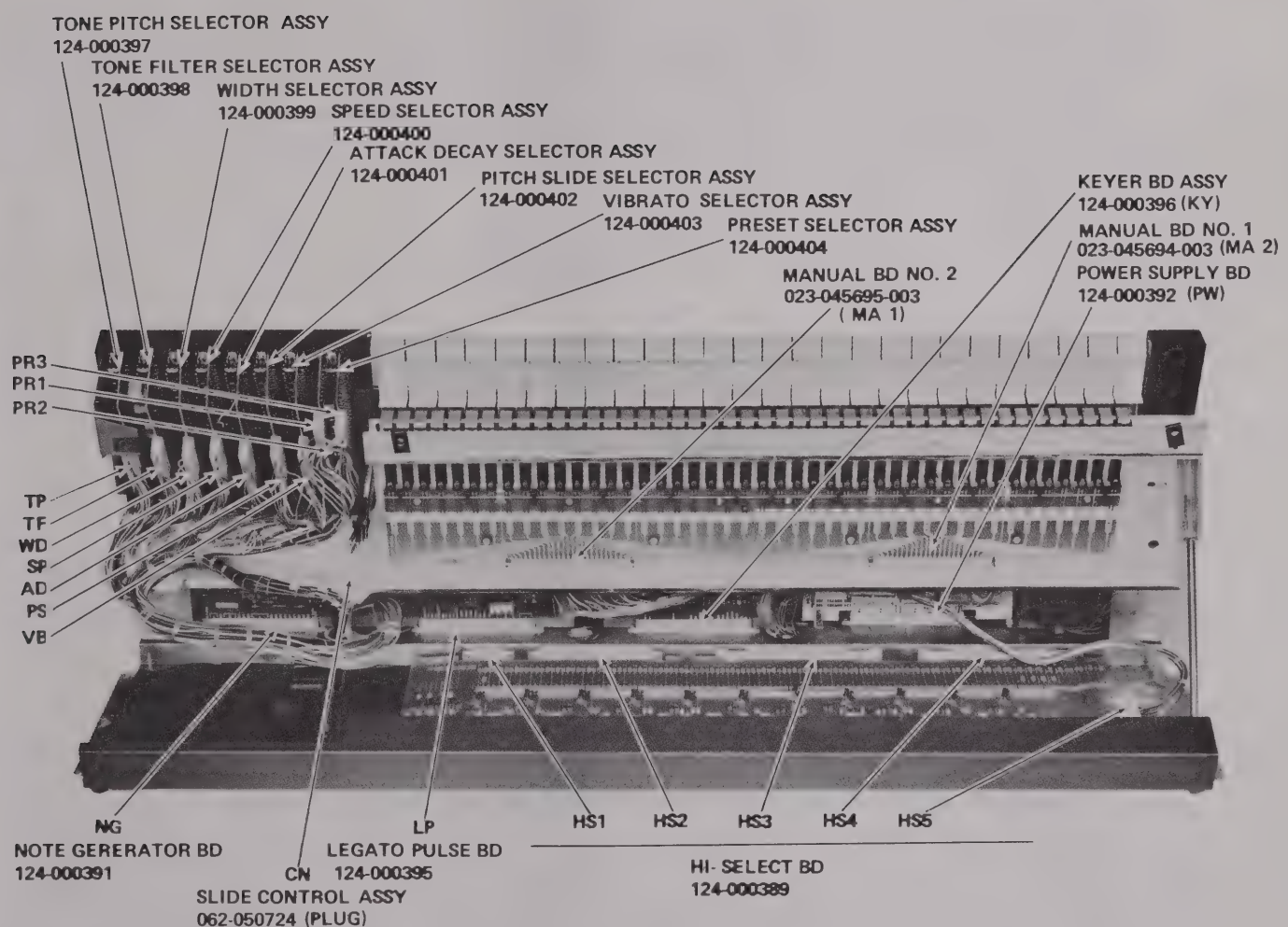
POTENTIOMETER LOCATION

FIGURE 2-8(A)

FIGURE 2-8(B)



BOARD CONNECTOR IDENTIFICATION



PLUG AND CONNECTOR IDENTIFICATION

CLEANING

PLASTIC KEYS AND BUTTON AND PRESET ASSEMBLY

CAUTION

Do not use any sprays or lubricants on buttons or preset tabs.

Clean plastic keys and button assembly lightly with a soft damp cloth or chamois. Wiping with a dry cloth builds up an electrostatic charge which will attract dust particles from the air. If cleaning agents are necessary, use pure facial soap and luke warm water. Dry without excessive rubbing. Do not use boiling water, strong solvents, such as alcohol, dry cleaning fluids, or window cleaning fluids which contains such solvents.

WOODWORK AND METAL FINISHES

Clean and dust woodwork and finished metal areas with a soft, damp cloth or chamois. If cleaning agents are necessary, use a soft cloth lightly dampened with a solution of mild soap and luke warm water. Remove solution, using a soft cloth dampened with clean water, dry thoroughly. On woodwork, rubbing with the grain, use a good grade of liquid furniture wax or polish. Avoid use of paste waxes or oil type polishes. Excessive rubbing in one spot or at edges may result in damage to finish.

SERVICE

PRODUCT SERVICE

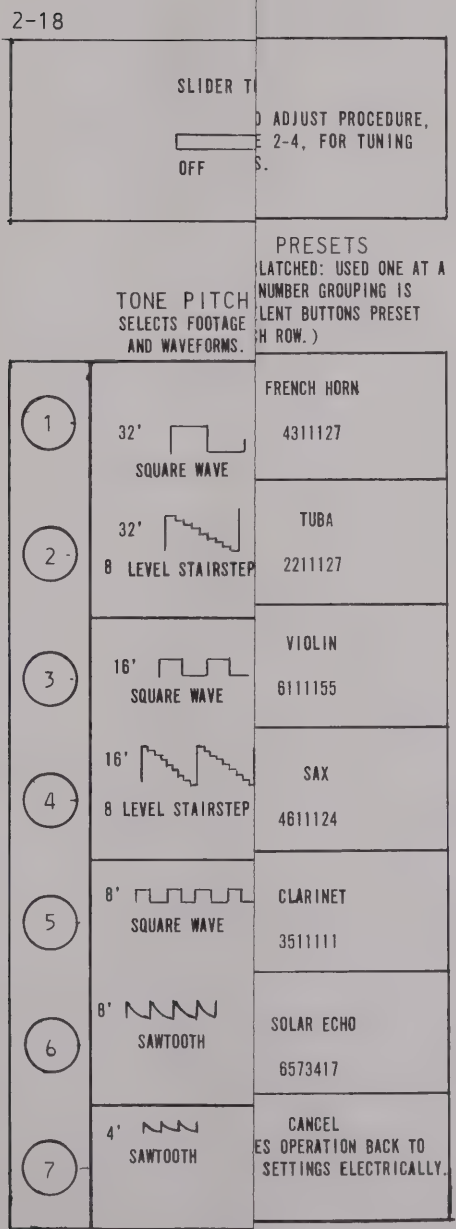
For product service, contact nearest authorized Hammond Service Center or write to: Manager, Product Service, Hammond Organ Company, 4200 West Diversey Avenue, Chicago, Illinois 60639.

PARTS ARE ALSO AVAILABLE BY CONTACTING PRODUCT SERVICE AS MENTIONED ABOVE.

IMPORTANT:

ALWAYS SUPPLY MODEL DESIGNATION AND SERIAL NUMBER WHEN WRITING.

2-18


SLIDER T
OFF
ADJUST PROCEDURE,
2-4, FOR TUNING
S.
PRESETS
LATCHED: USED ONE AT A
NUMBER GROUPING IS
LENT BUTTONS PRESET
H ROW.)
TONE PITCH
SELECTS FOOTAGE
AND WAVEFORMS.
1
32'
SQUARE WAVE
FRENCH HORN
4311127
2
32'
8 LEVEL STAIRSTEP
TUBA
2211127
3
16'
SQUARE WAVE
VIOLIN
6111155
4
16'
8 LEVEL STAIRSTEP
SAX
4611124
5
8'
SQUARE WAVE
CLARINET
3511111
6
8'
SAWTOOTH
SOLAR ECHO
6573417
7
4'
SAWTOOTH
CANCEL
ES OPERATION BACK TO
SETTINGS ELECTRICALLY.

CLEANING

PLASTIC KEYS AND BUTTON AND PRESET ASSEMBLY

CAUTION

Do not use any sprays or lubricants on buttons or preset tabs.

Clean plastic keys and button assembly lightly with a soft damp cloth or chamois. Wiping with a dry cloth builds up an electrostatic charge which will attract dust particles from the air. If cleaning agents are necessary, use pure facial soap and luke warm water. Dry without excessive rubbing. Do not use boiling water, strong solvents, such as alcohol, dry cleaning fluids, or window cleaning fluids which contains such solvents.

WOODWORK AND METAL FINISHES

Clean and dust woodwork and finished metal areas with a soft, damp cloth or chamois. If cleaning agents are necessary, use a soft cloth lightly dampened with a solution of mild soap and luke warm water. Remove solution, using a soft cloth dampened with clean water, dry thoroughly. On woodwork, rubbing with the grain, use a good grade of liquid furniture wax or polish. Avoid use of paste waxes or oil type polishes. Excessive rubbing in one spot or at edges may result in damage to finish.

SERVICE

PRODUCT SERVICE

For product service, contact nearest authorized Hammond Service Center or write to: Manager, Product Service, Hammond Organ Company, 4200 West Diversey Avenue, Chicago, Illinois 60639.

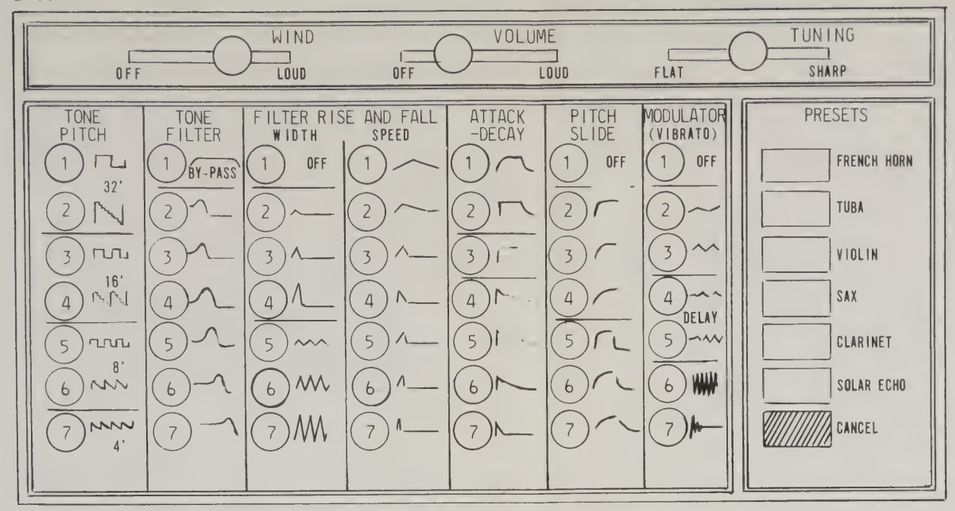
PARTS ARE ALSO AVAILABLE BY CONTACTING PRODUCT SERVICE AS MENTIONED ABOVE.

IMPORTANT:

ALWAYS SUPPLY MODEL DESIGNATION AND SERIAL NUMBER WHEN WRITING.

2-17

SYNTHESIZER PANEL



2-18

BUTTONS AND PRESET DESCRIPTION CHART

SLIDER TO ADJUST WIND LOUDNESS

OFF — MAX.

SLIDER TO ADJUST VOLUME LOUDNESS (EXCEPT WIND)

OFF — MAX.

SLIDER TO ADJUST TUNING

FLAT 6% — NORMAL — SHARP 6%

NOTE:
SEE TEST AND ADJUST PROCEDURE, STEP 2, PAGE 2-4, FOR TUNING INSTRUCTIONS.

	TONE PITCH SELECTS FOOTAGE AND WAVEFORMS.	TONE FILTER VOLTAGE CONTROLLED (V.C.F.)	TONE FILTER RISE AND FALL WIDTH	TONE FILTER RISE AND FALL SPEED	ATTACK AND DECAY (VOLTAGE CONTROLLED AMP.)	PITCH SLIDE TRIGGERED SLIDE UP OR SLIDE UP AND DOWN	MODULATOR (VIBRATO) FREE RUNNING, NOT TRIGGERED. RISE AND FALL OF PITCH OF ALL NOTES.	PRESETS (INTERLATCHED: USED ONE AT A TIME. NUMBER GROUPING IS EQUIVELENT BUTTONS PRESET IN EACH ROW.)
1	32' SQUARE WAVE	FULL TONE NO RESONANCE. FILTER BY-PASSED.	OFF NO RISE AND FALL. FILTER STAYS AT REST.	ONE SHOT OR REPEATING .33 HZ. ULTRA SLOW	50 ms. 50 ms. SLOW ATTACK & DECAY TOUCH RESPONSE TRIGGERED 10 ms. FAST ATTACK & DECAY 100 ms.	OFF NO SLIDES. NORMAL NOTE TUNING.	OFF NO MODULATION.	FRENCH HORN 4311127
2	32' 8 LEVEL STAIRSTEP	RESONANCE AT REST 220 HZ .1 MFD	"ONE SHOT" NARROW	1.5 SEC 1.5 SEC VERY SLOW RISE — VERY SLOW FALL .5 HZ VERY SLOW .5 1.5 SEC. SLOW RISE — VERY SLOW FALL .85 HZ SLOW .5 .65 SEC. SLOW RISE — MED. FALL 1.5 HZ MED. 5ms .65 sec. VERY FAST RISE — MED. FALL 3.3HZ FAST .15 .15 SEC. MED. RISE — FAST FALL 4.5HZ VERY FAST .07 .15 SEC. FAST RISE — FAST FALL 6.55 HZ ULTRA FAST 5ms .15 SEC. VERY FAST RISE — FAST FALL	10 ms. SOSTENUTO FAST ATTACK TOUCH START TRIGGERED	FAST SLIDE UP (10 ms.)* MED. SLIDE UP (.4 SEC.) SLOW SLIDE UP (.75 SEC.) SLIDE UP ONLY	VIBRATO SLOW 5.8 HZ. NARROW ±½ %	TUBA 2211127
3	16' SQUARE WAVE	600 HZ .022	MEDIUM				VIBRATO 6.8 HZ FAST WIDE ± 2 %	VIOLIN 6111155
4	16' 8 LEVEL STAIRSTEP	1500 HZ .0022	WIDE ONE SHOT RISE AND FALL: 3 WIDTHS. TOUCH RESPONSE TRIGGERED: RESET DURING CYCLE. SEVEN SLOPE COMBINATIONS SELECTED BY SPEED ROW.		SUSTAIN CONTINUES AFTER LONG DECAY 3 SEC. — KEY RELEASE. PERC. SNUBBED AFTER LONG DECAY 3 SEC. — KEY RELEASE MED. DECAY 1.0 SEC. (PIZZICATO) VERY SHORT DECAY .75 ms. (ALL VERY FAST PERCUSSIVE ATTACK) — DELTA - HI - NOTE TRIGGERED	FAST UP AND DOWN (10 ms.)* MED. UP AND DOWN .4 SEC. SLOW UP AND DOWN (.75 SEC.) SLIDE UP AND DOWN — ALL SLIDES ARE TOUCH-RESPONSE TRIGGERED	VIBRATO, SLOW, NARROW DELAYED ± ½ % 5.8 HZ (.5 SEC. T.R. MODE.) DELAYED VIBRATO, FAST, WIDE ± 2 % 6.8 HZ	SAX 4611124
5	8' SQUARE WAVE	2000 HZ .0033	"REPEATING" NARROW				RAZZ VERY FAST 35 HZ WIDE ± 10 %	CLARINET 3511111
6	8' SAWTOOTH	4000 HZ .022	MEDIUM				GROWL ATTACK FAST 50 HZ. WIDE ± 10 % T.R. MODE GATED.	SOLAR ECHO 6573417
7	4' SAWTOOTH	7000 HZ .022	WIDE REPEATING, FREE RUNNING: NOT TRIGGERED. SEVEN SLOPE COMBINATIONS SELECTED BY SPEED ROW.					CANCEL RESTORES OPERATION BACK TO BUTTON SETTINGS ELECTRICALLY.

* (TO BE INCREASED)

CTION III
MS AND TEXT

tic diagrams and text to illustrate and provide information

STRATIONS

02100

		PAGE
ıs		3- 1
. . . . .		3- 2
. . . . .		3- 3
. . (124-000389).	(1)	3- 4
. . (124-000389).	(1)	3- 5
tic, . . .(124-000390).	(2)	3- 6
, . . .(124-000391).	(3)	3- 7
. . (124-000393).	(4)	3- 8
lc . (124-000393).	(4)	3- 9
. . (124-000394).	(5)	3-10
. . (124-000395).	(6)	3-11
. . (124-000396).	(7)	3-12
. . (124-000392).	(8)	3-13
ts . (124-000397 thru 124-000404	(9)- (16)	3-14
. . (124-000397 thru 124-000403) . . .	(9)- (15)	3-15
. . . . .		3-16

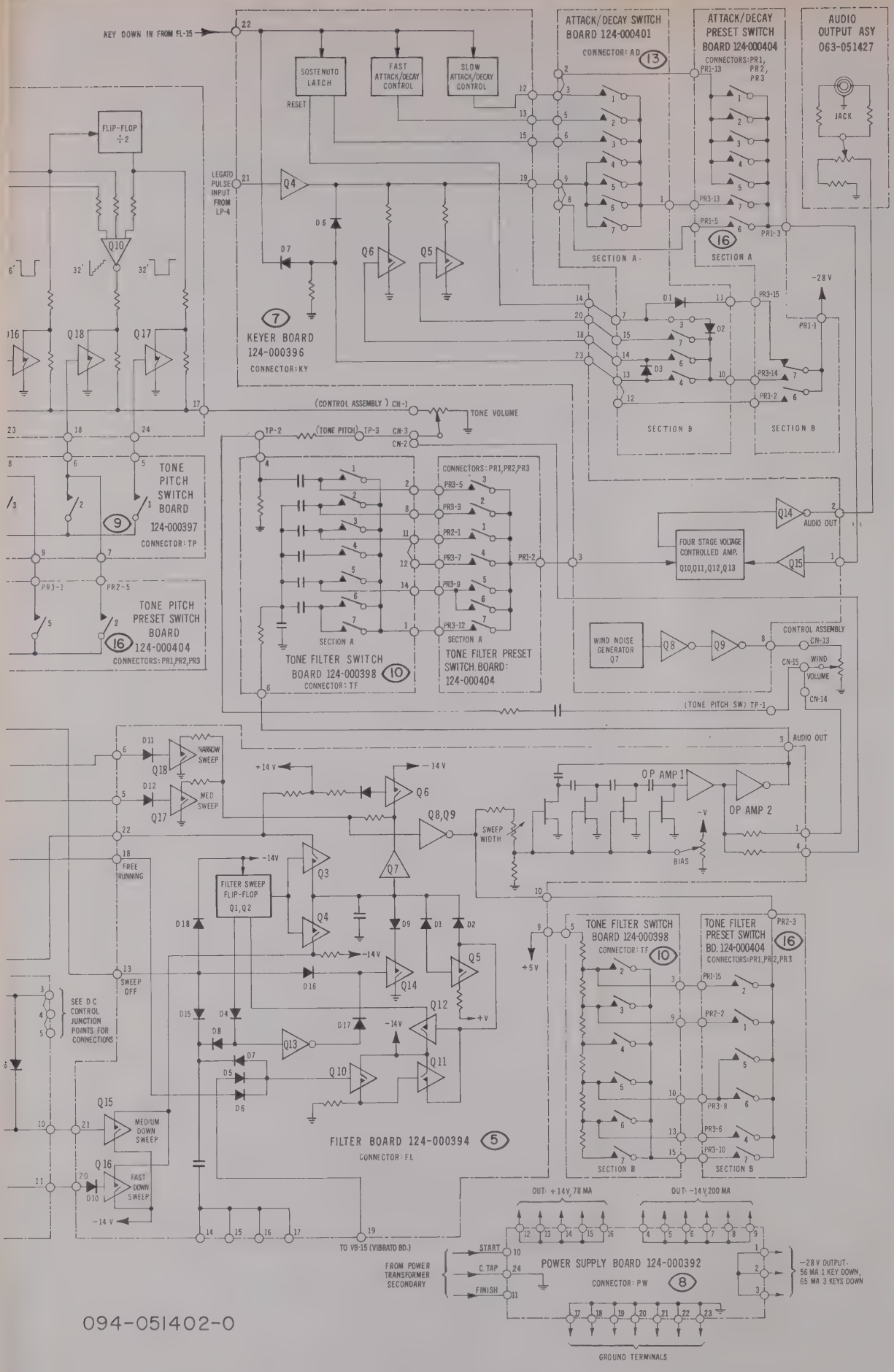
SECTION III
DIAGRAMS AND TEXT

3–1. GENERAL.– This section contains schematic diagrams and text to illustrate and provide information necessary to proper organ servicing.

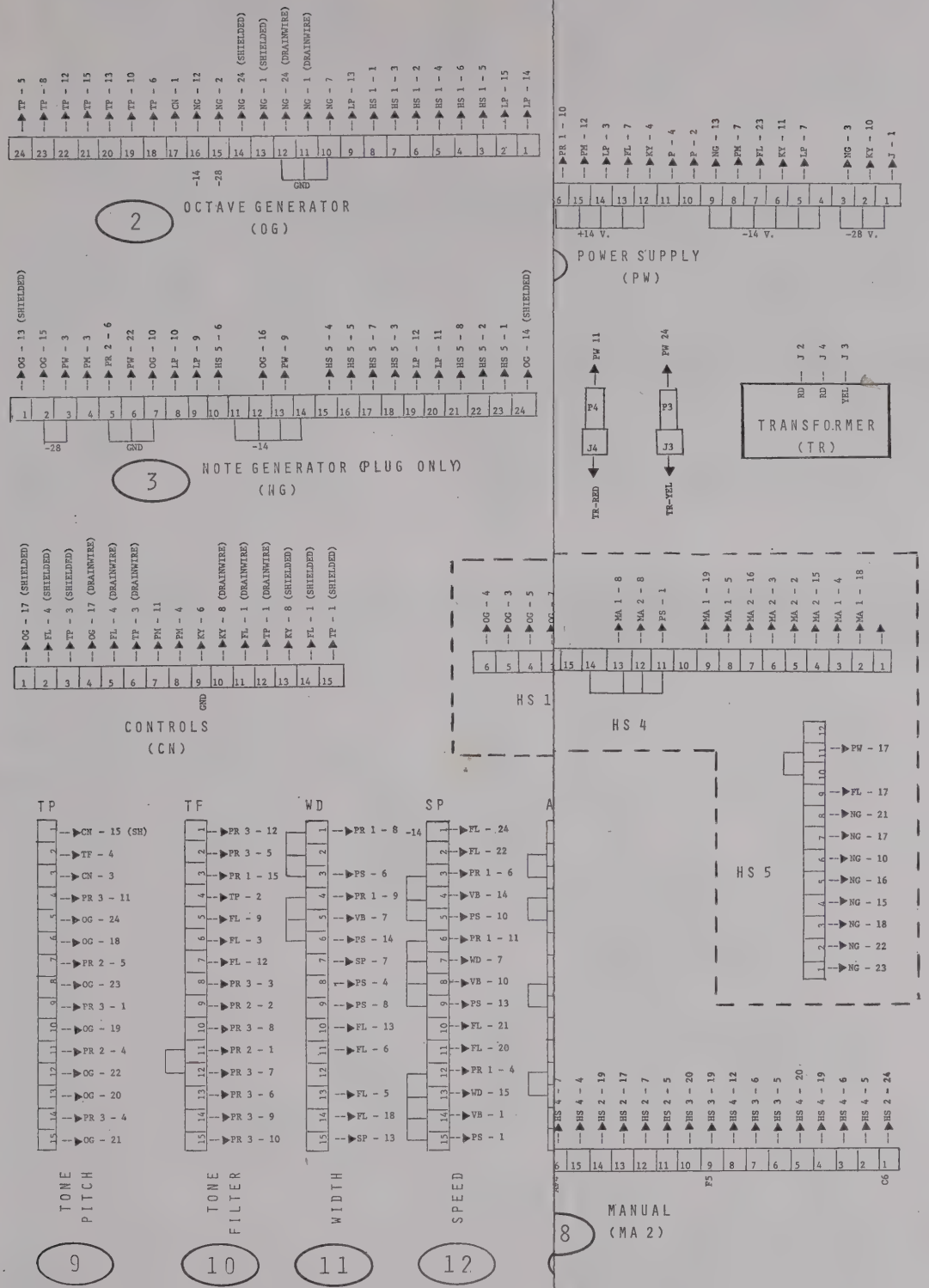
LIST OF ILLUSTRATIONS

SYNTHESIZER 102100

FIGURE			PAGE
	General and List of Illustrations		3- 1
3- 1	Synthesizer Logic Diagram		3- 2
3- 2	Point to Point Wiring Diagram		3- 3
3-3	Hi-Select Board - Layout and Theory	(124-000389) 1	3- 4
3- 4	Hi-Select Board Schematic	(124-000389) 1	3- 5
3- 5	Octave Generator Board - Schematic, Layout and Theory	(124-000390) 2	3- 6
3- 6	Note Generator Board - Schematic, Layout and Theory	(124-000391) 3	3- 7
3- 7	Pitch Modulator Board Layout and Theory	(124-000393) 4	3- 8
3- 8	Pitch Modulator Board - Schematic	(124-000393) 4	3- 9
3- 9	Filter Board - Schematic, Layout and Theory	(124-000394) 5	3-10
3-10	Legato Pulse Board - Schematic, Layout and Theory	(124-000395) 6	3-11
3-11	Keyer Board - Schematic, Layout and Theory	(124-000396) 7	3-12
3-12	Power Supply Board - Schematic, Layout and Theory	(124-000392) 8	3-13
3-13	Preset and Switch Boards, Layouts	(124-000397 thru 124-000404) 9-16	3-14
3-14	Switch Boards - Schematics	(124-000397 thru 124-000403) 9-15	3-15
3-15	Synthesizer Flow Block Diagram		3-16


KEY DOWN IN FROM FL-15
SOSTENUTO LATCH
RESET
FAST ATTACK/DECAY CONTROL
SLOW ATTACK/DECAY CONTROL
ATTACK/DECAY SWITCH BOARD 124-000401
CONNECTOR: AD
13
ATTACK/DECAY PRESET SWITCH BOARD 124-000404
CONNECTORS: PR1, PR2, PR3
AUDIO OUTPUT ASY 063-051427
JACK
FLIP-FLOP ÷2
LEGATO PULSE INPUT FROM LP-4
Q4
D6
D7
Q6
Q5
SECTION A
16
SECTION A
-28 V
7
KEYER BOARD 124-000396
CONNECTOR: KY
D1
D2
D3
SECTION B
SECTION B
(CONTROL ASSEMBLY) CN-1
TONE VOLUME
TP-2
(TONE PITCH)
TP-3
CN-3
CN-2
TONE PITCH SWITCH BOARD 124-000397
CONNECTOR: TP
9
CONNECTORS: PR1, PR2, PR3
TONE PITCH PRESET SWITCH BOARD 124-000404
CONNECTORS: PR1, PR2, PR3
SECTION A
TONE FILTER SWITCH BOARD 124-000398
CONNECTOR: TF
10
SECTION A
TONE FILTER PRESET SWITCH BOARD: 124-000404
Q14
AUDIO OUT
FOUR STAGE VOLTAGE CONTROLLED AMP. Q10, Q11, Q12, Q13
Q15
WIND NOISE GENERATOR Q7
Q8
Q9
CONTROL ASSEMBLY
CN-13
CN-15
WIND VOLUME
CN-14
(TONE PITCH SW) TP-1
AUDIO OUT
D11
NARROW SWEEP
Q18
D12
MED. SWEEP
Q17
+14 V
-14 V
Q6
Q8,Q9
SWEEP WIDTH
O.P AMP 1
OP AMP 2
-V
BIAS
FREE RUNNING
FILTER SWEEP FLIP-FLOP Q1, Q2
Q3
Q7
Q4
D18
D9
D1
D2
Q5
+V
D16
Q14
D15
D4
D8
D17
Q12
Q13
Q11
Q10
D7
D5
D6
SWEEP OFF
SEE D.C. CONTROL JUNCTION POINTS FOR CONNECTIONS
Q15
MEDIUM DOWN SWEEP
Q16
FAST DOWN SWEEP
D10
-14 V
FILTER BOARD 124-000394
CONNECTOR: FL
5
+5 V
TONE FILTER SWITCH BOARD 124-000398
CONNECTOR: TF
10
TONE FILTER PRESET SW. BD. 124-000404
CONNECTORS: PR1, PR2, PR3
16
SECTION B
SECTION B
TO VB-15 (VIBRATO BD.)
OUT: +14 V, 78 MA
OUT: -14 V, 200 MA
START
C. TAP
FINISH
FROM POWER TRANSFORMER SECONDARY
POWER SUPPLY BOARD 124-000392
CONNECTOR: PW
8
-28 V OUTPUT- 56 MA 1 KEY DOWN, 65 MA 3 KEYS DOWN
GROUND TERMINALS

094-051402-0

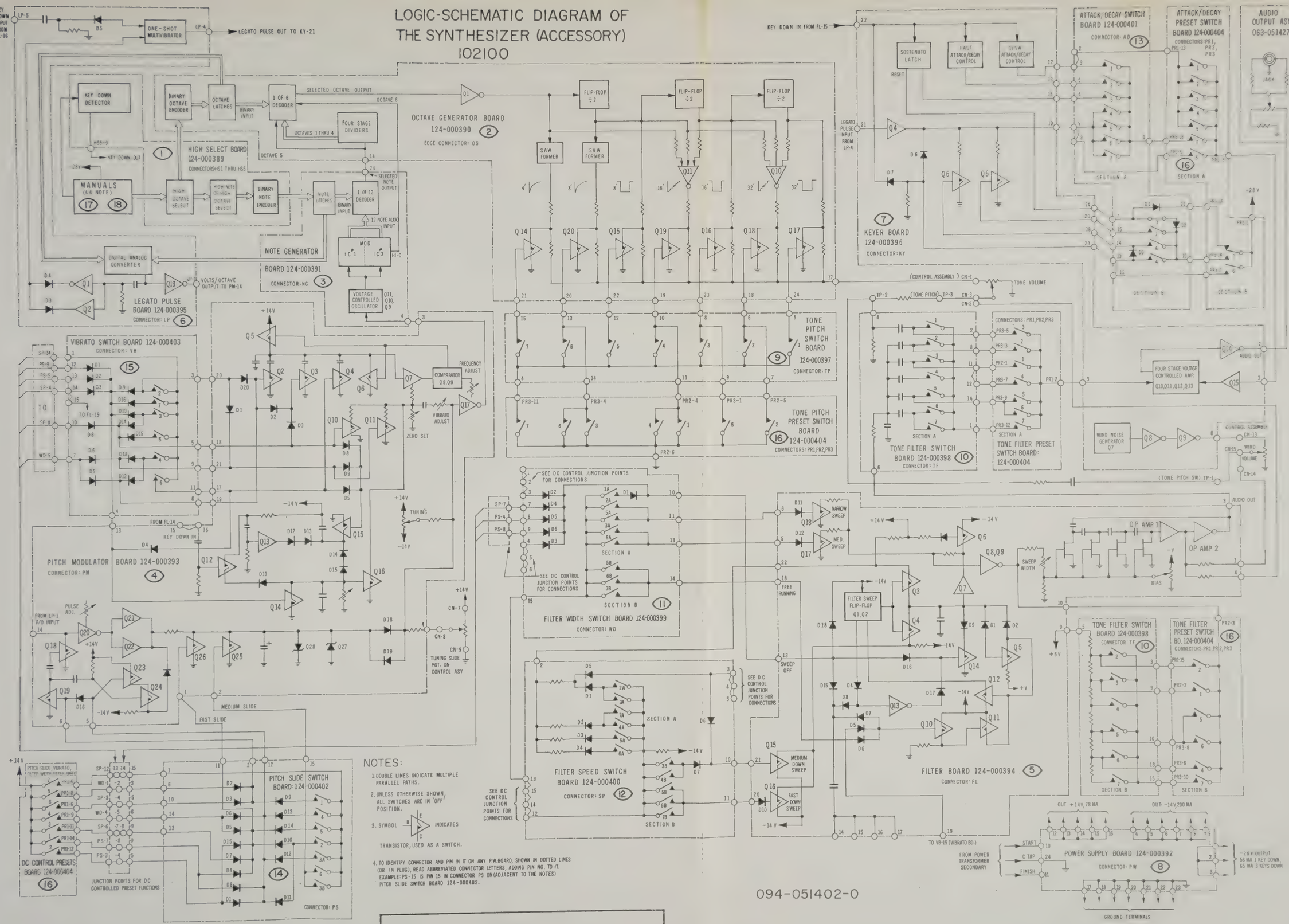


1. 124-000389 - HI-SELECT BOA.....(SP)
2. 124-000390 - OCTAVE GENERA.....(AD)
3. 124-000391 - NOTE GENERATO.....(PS)
4. 124-000393 - PITCH MODULAT.....(VB)
5. 124-000394 - FILTER BOARD .....(PR)
6. 124-000395 - LEGATO PULSE .....(MA1)
7. 124-000396 - KEYER BOARD .....(MA2)

FIGURE 3-2

POINT TO POINT
WIRING DIAGRAM
SYNTHESIZER - 102100

LOGIC-SCHEMATIC DIAGRAM OF THE SYNTHESIZER (ACCESSORY) 102100



NOTES:

1. DOUBLE LINES INDICATE MULTIPLE PARALLEL PATHS.
2. UNLESS OTHERWISE SHOWN, ALL SWITCHES ARE IN "OFF" POSITION.
3. SYMBOL INDICATES TRANSISTOR, USED AS A SWITCH.
4. TO IDENTIFY CONNECTOR AND PIN IN IT ON ANY P.W.BOARD, SHOWN IN DOTTED LINES (OR 'IN PLUG), READ ABBREVIATED CONNECTOR LETTERS, ADDING PIN NO. TO IT. EXAMPLE: PS-15 IS PIN 15 IN CONNECTOR PS ON (ADJACENT TO THE NOTES) PITCH SLIDE SWITCH BOARD 124-000402.

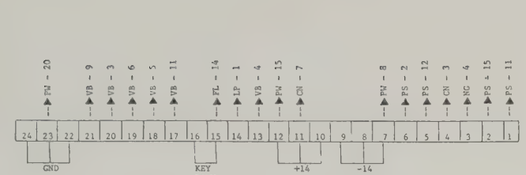
094-051402-0

FIGURE 3-1

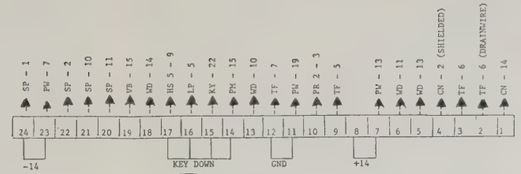
SYNTHESIZER
LOGIC DIAGRAM
SYNTHESIZER - 102100

POINT TO POINT WIRING CHART

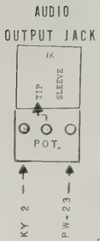
2 OCTAVE GENERATOR (OG)

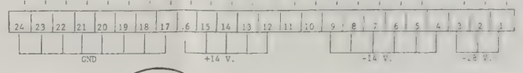


4 PITCH MODULATOR (PM)

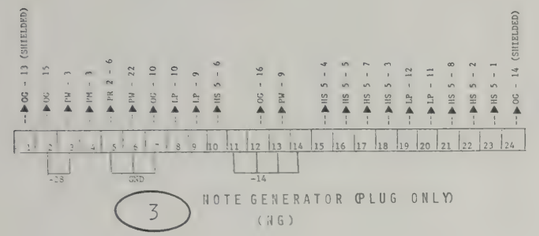


5 FILTER (FL)

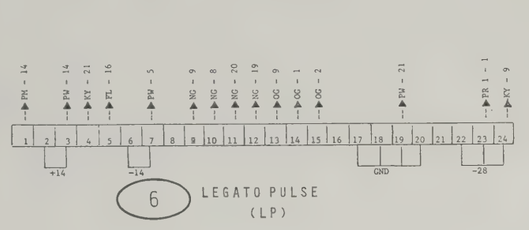




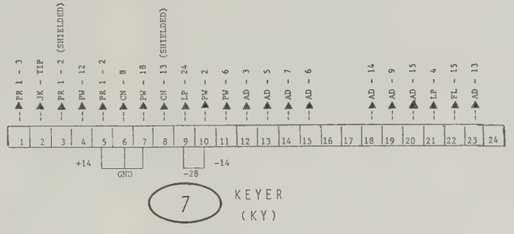
8 POWER SUPPLY (PW)



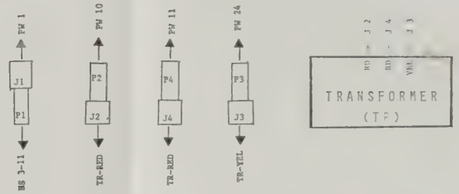
3 NOTE GENERATOR (PLUG ONLY) (NG)

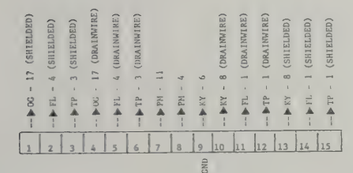


6 LEGATO PULSE (LP)

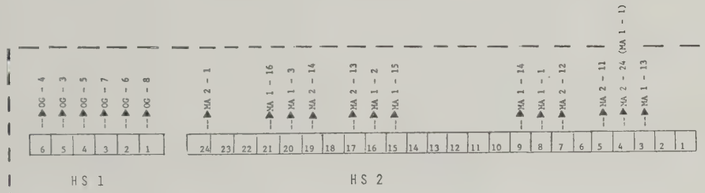


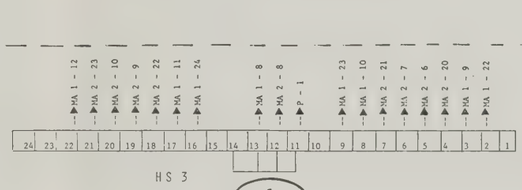
7 KEYER (KY)



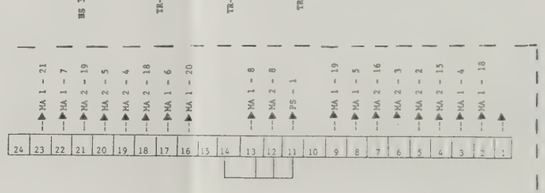


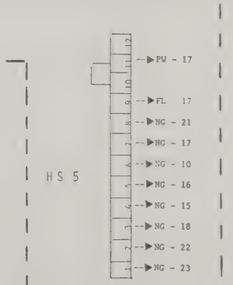
CONTROLS (CH)

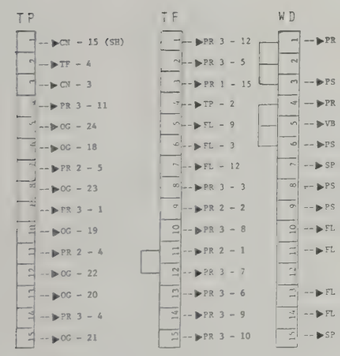


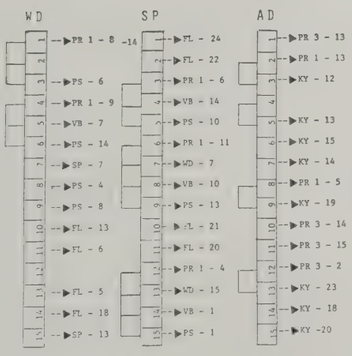


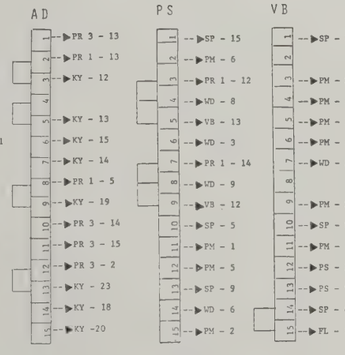
HIGH SELECT (HS) 1

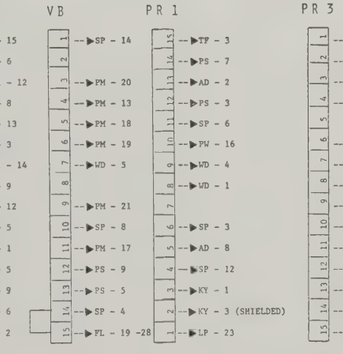


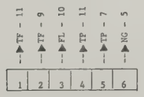


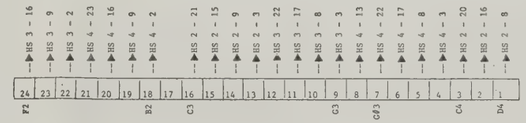




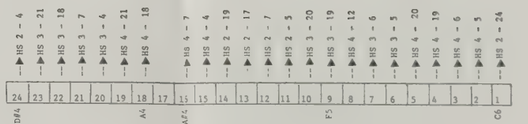








17 MANUAL (MA 1)



18 MANUAL (MA 2)

(1) 124-000389 - HI-SELECT BOARD .....(HS)

(2) 124-000390 - OCTAVE GENERATOR BOARD ....(OG)

(3) 124-000391 - NOTE GENERATOR BOARD .....(NG)

(4) 124-000393 - PITCH MODULATOR BOARD .....(PM)

(5) 124-000394 - FILTER BOARD .....(FL)

(6) 124-000395 - LEGATO PULSE BOARD .....(LP)

(7) 124-000396 - KEYER BOARD .....(KY)

(8) 124-000392 - POWER SUPPLY BOARD .....(PW)

(9) 124-000397 - TONE PITCH BOARD .....(TP)

(10) 124-000398 - TONE FILTER BOARD.....(TF)

(11) 124-000399 - WIDTH SWITCH BOARD .....(WD)

(12) 124-000400 - SPEED SWITCH BOARD .....(SP)

(13) 124-000401 - ATTACK/DECAY BOARD .....(AD)

(14) 124-000402 - PITCH SLIDE BOARD .....(PS)

(15) 124-000403 - VIBRATO BOARD .....(VB)

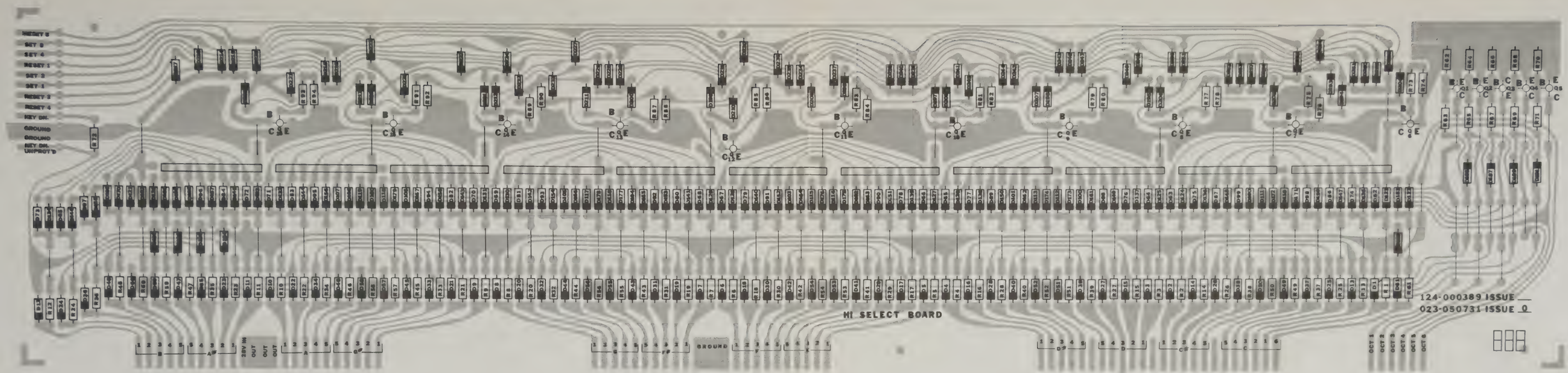
(16) 124-000404 - PRESET ASSEMBLY .....(PR)

(17) MANUAL PRINTED WIRING BOARD NO. 1 .....(MA1)

(18) MANUAL PRINTED WIRING BOARD NO. 2 .....(MA2)

FIGURE 3-2

POINT TO POINT WIRING DIAGRAM SYNTHESIZER - 102100



NOTE	C1	C#1	D1	D#1	E1	F1	F#1	G1	G#1	A1	A#1	B1	C2	C#2	D2	D#2	E2	F2	F#2	G2	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6
PLUG (HS)	2	2	2	2	3	3	3	3	4	4	4	4	2	2	2	2	3	3	3	3	4	4	4	4	2	2	2	2	3	3	3	3	4	4	4	4	2	2	2	2	3	3	3	3	4	4	4	4	2	2	2	2	3	3	3	3	4	4	4	4	2
PIN	23	13	11	1	24	15	10	1	24	15	10	1	22	14	10	2	23	16	9	2	23	16	9	2	21	15	9	3	22	17	8	3	22	17	3	3	20	16	8	4	21	18	7	4	21	18	7	4	19	17	7	5	20	19	6	5	20	19	6	5	24

HIGH SELECT BOARD 124-000389

The 124-000389 High Select Board has inputs from the manual keys played and produces outputs as follows:

A) A negative output signal on terminals 9 and 12 whenever one or more keys are played.
B) A negative output signal on one of 6 output lines indicating the highest octave in which any note is played.
C) Negative voltage outputs on 4 of 8 set and reset terminals. Each combination of four negative voltages comprises a binary coded output that defines the highest note letter within the highest octave of all keys being played.

Manual keying voltages are collected in octave groups through resistor diode combinations (R1 and D62 for note C1 and a similar combination for each note). Each octave collect bus, terminals HS1 - 1 through HS1 - 6 is controlled by a lock-out circuit comprised of transistors Q1 through Q6. If, for example, a keying signal is applied from manual key C6 a negative voltage is fed through diode D61 to the base of Q5 to turn on Q5 and ground out the signals on octave 5 collect bus HS1 - 5. The keying signal is also fed through a string of diodes D191, D189, D187, and D185 to turn on transistors Q4, Q3, Q2, and Q1 which ground out all lower octave busses. As a result, keying voltages from all key switches actuated in octaves 1 through 5 will be shorted to ground.

If the highest notes played are in octave 5, the keying voltages collected through diodes D49 through D60 are used to turn on transistors Q1 through Q4 thus shorting out keying voltages from notes played in octaves 1 through 4. In a like manner a keying voltage in any one octave shorts out keying voltages from notes played in any lower octaves. Thus the voltages that may appear on note busses C through B are only those from notes in the highest octave in which any notes are played.

The groups of keying voltages collected through diodes D49 through D60 for octave 5, and in similar groups for other octaves, are further collected through diodes D184, D186, D188, D190 and D192 to produce a negative output voltage on terminals HS5 - 9 and HS5 - 12 whenever <u>any</u> key is played.

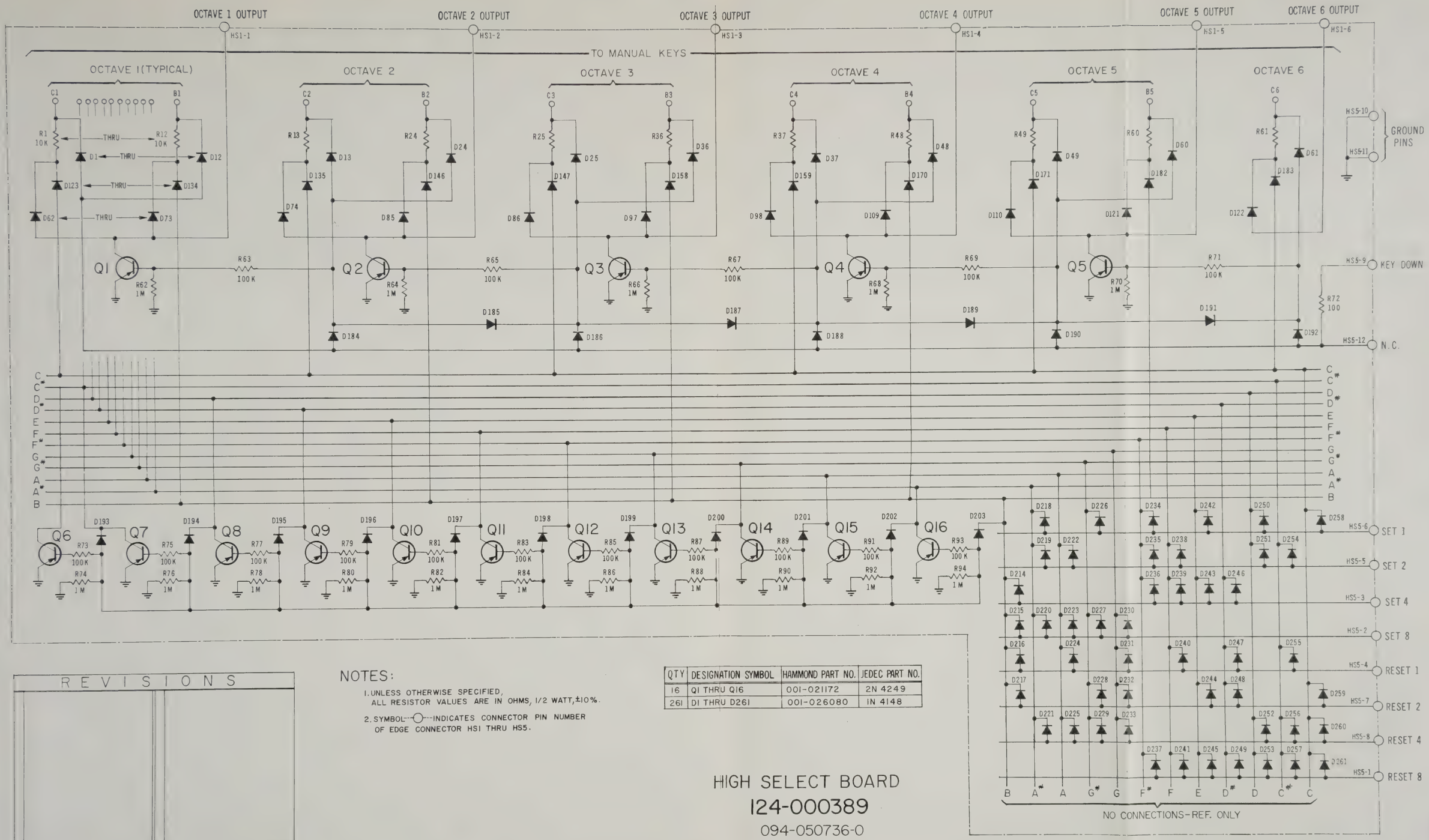
In a manner analogous to the octave lockout circuits, note lockout circuits Q6 through Q16 short out note busses for all notes lower than the highest note played. For example, if note B is played, voltage from note bus B will be fed by diode D203 to the base of Q16 which turns on and shorts out note bus A#. This voltage will also be transmitted through the chain of diodes D204 through to D213 to turn on transistors Q6 through Q15 which in turn short out note busses C through A. In a similar manner any note played shorts out all lower notes.

The voltage remaining on the highest note bus is transmitted through the appropriate diodes in a binary encoding matrix to produce a binary coded output defining that note.

If for example B is the highest note, negative voltages will appear at Reset 1, Reset 2, Set 4 and Set 8. This coded output is fed into the note generator board (124-000391) and determines the selected note output, in this case the "B" is the note allowed to sound.

FIGURE -3-3

HI - SELECT BOARD
LAYOUT AND THEORY
(124-000389)



REVISIONS

NOTES:

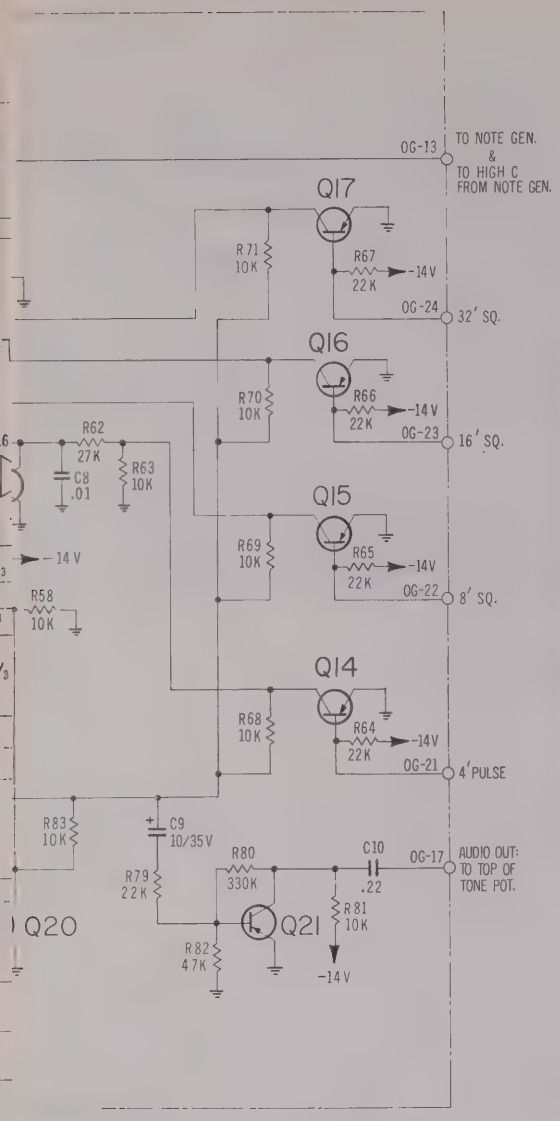
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%.
2. SYMBOL ---○--- INDICATES CONNECTOR PIN NUMBER OF EDGE CONNECTOR HS1 THRU HS5.

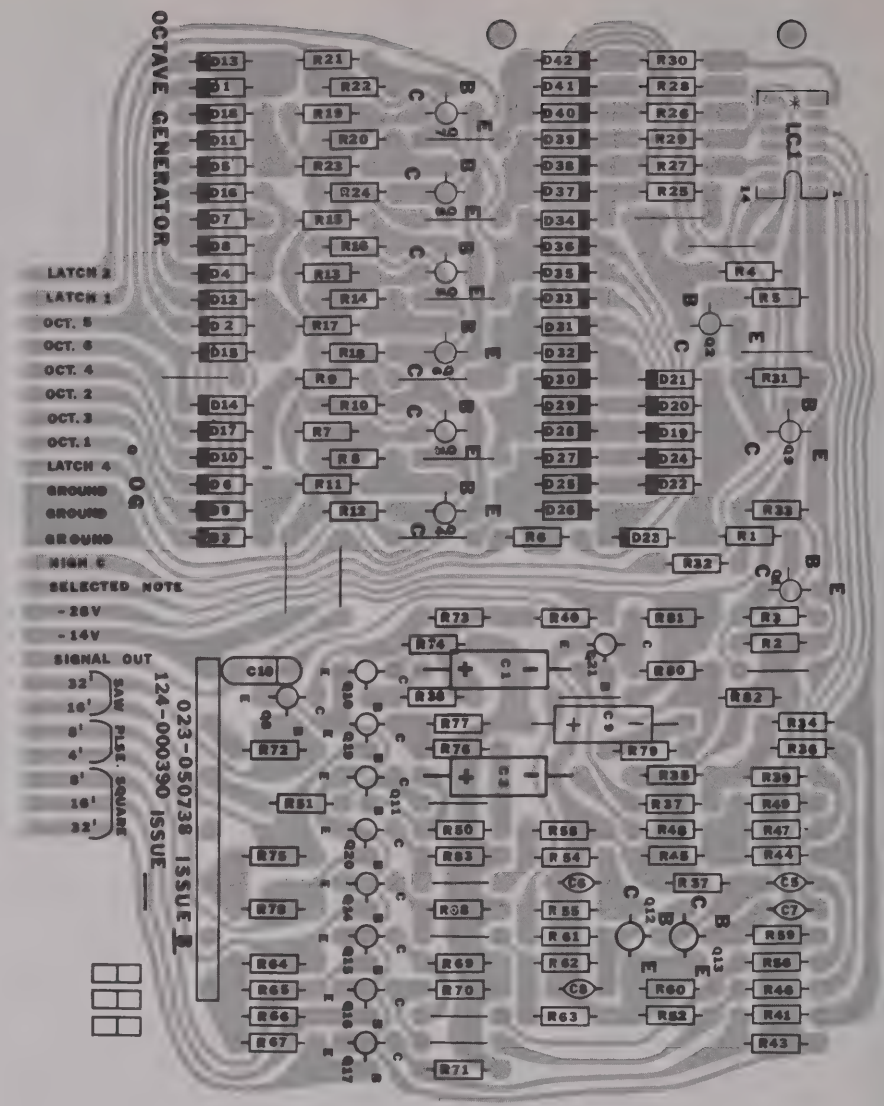
QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
16	Q1 THRU Q16	001-021172	2N 4249
261	D1 THRU D261	001-026080	IN 4148

HIGH SELECT BOARD
124-000389
094-050736-0

FIGURE 3-4

HI - SELECT BOARD
SCHEMATIC
(124-000389)





* IC#1 EARLY UNITS 075-047298-001
CURRENT 075-000200

the binary word stored in latches 1, 2, and
nly-one of these signals will be gated
mplifier Q1.

if octave six is called for, a negative
appear on board terminal 4. This voltage
ches 2 and 4 and reset latch 1. Transistors
Q4 will be off, hence negative voltage will
ese collectors. These negative collector
1 back-bias diodes D37, D34, and D28 and
gnal at the collector of Q2 to pass through
the base of Q1. Examination will show that
of the decoder-diodes on every other line
ted to ground through a conducting latch
and hence those signals will not appear at
milar manner each octave called for will
-and-only-one of the frequency inputs to the
ix.

signal at the base of Q1 is amplified and
1 and routed to terminal 2 of IC1. This
peatedly divided-by-two to produce lower
erminals 3, 4, and 5, of IC1. The square-
at terminals 3, 4, and 5 of IC1 are mixed
nd 1 ratio by resistors R34, R36, and R39 to

produce a 32 foot sawtooth. This signal is amplified by Q10 and fed to the base amplifier Q21 through R73 and R74, providing that Q18 is turned off. Q18 functions as a shunt switch, holding the signal off until Q18 is turned off by connecting terminals 18 to ground.

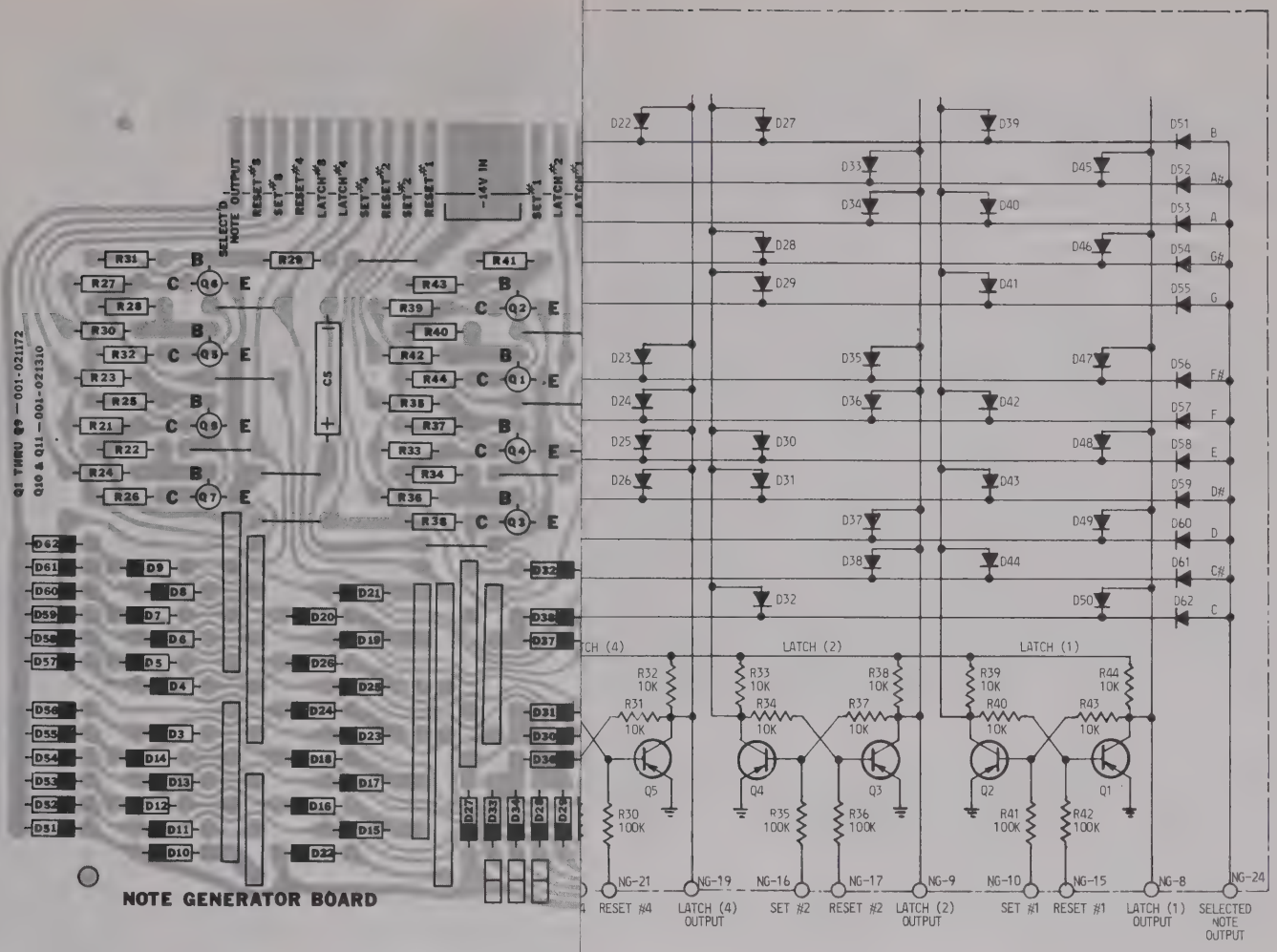
The 16 foot sawtooth circuitry is similar to the 32 foot, using resistors R44, R47, and R49 as the mixing resistors, Q11 as the amplifier, and Q19 as the switch transistor.

The 32 foot squarewave signal at pin 5 of IC1 is isolated and attenuated by resistors R41 and R43 and fed to amplifier Q21 via R71. D17 functions as the switch transistor.

The 16 foot and 8 foot squarewave signals at terminals 3 and 4 of IC1 are processed in a manner similar to the 32 foot squarewave signal.

The 8 foot pulse waveform is generated by Q12 and associated components. Q12 is normally off, allowing C6 to charge toward -14 volts through R55. When the squarewave signal at pin 3 of IC1 goes negative, a pulse coupled through C5 to the base of Q12 turns Q12 on, and C6 discharges through Q12. The charge-discharge cycle repeats with each cycle of the squarewave. The pulse is coupled through R54 and R83 to amplifier Q21. Q20 serves as the switch transistor.

The 4 foot pulse is generated in a similar manner using Q13 as the discharge transistor and Q14 as the switch transistor.



REVISIONS	
WAS 100K.	

NOTE GENERATOR

The Note Genera gnals except the de-
cy oscillator d to ground.
drives a two-p

binary note word
Four note latc uts will select the
note informati e decoder matrix and
bring the sele The high C note
line. The hig ncluded in the decoder
is not include y the octave generator
brought to a s he only note in octave
as an octave b

A binary encod
board is appli
tablish the st

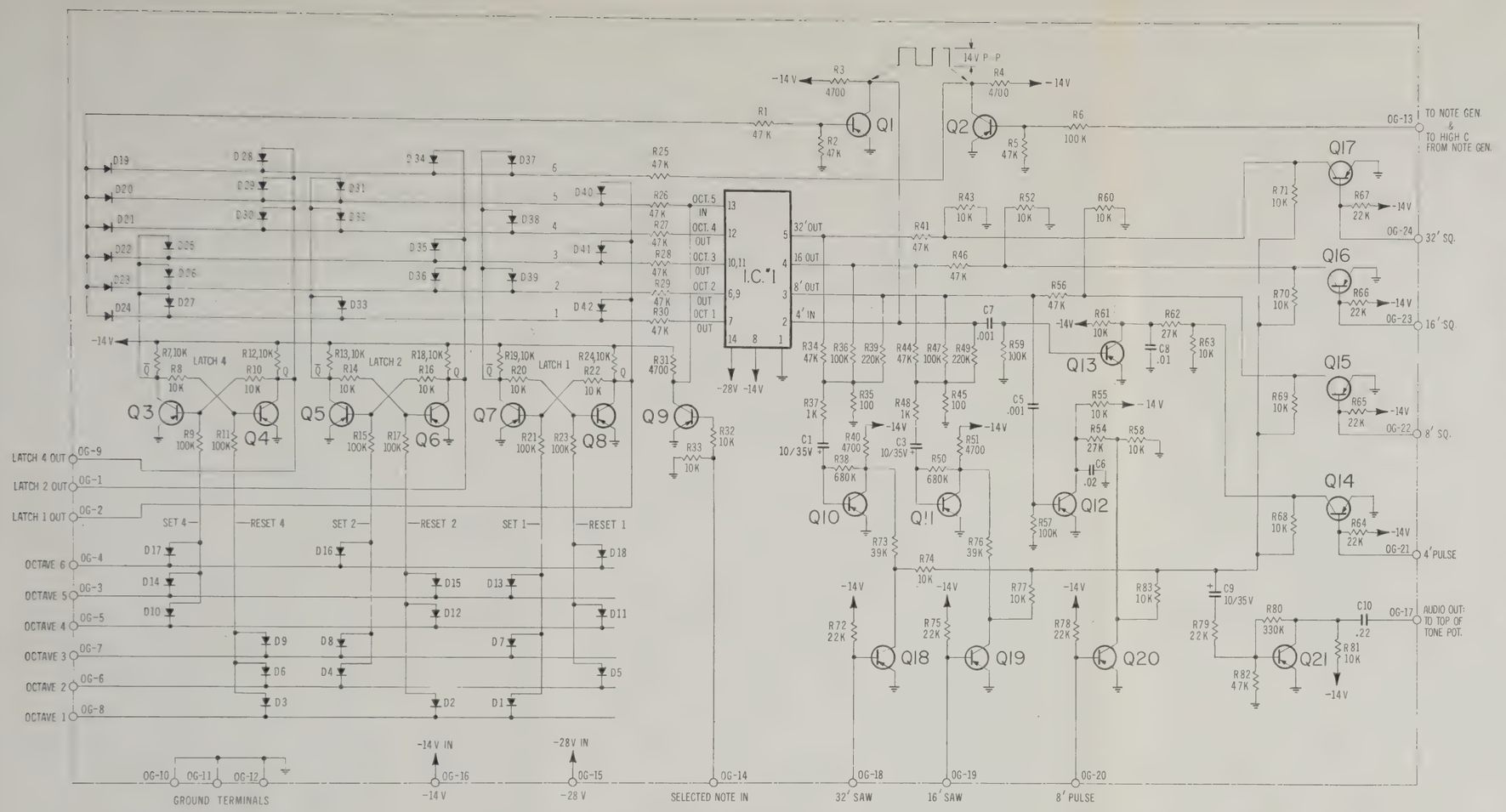
Transistor Q10
oscillator wit
determined by
terminal 4.

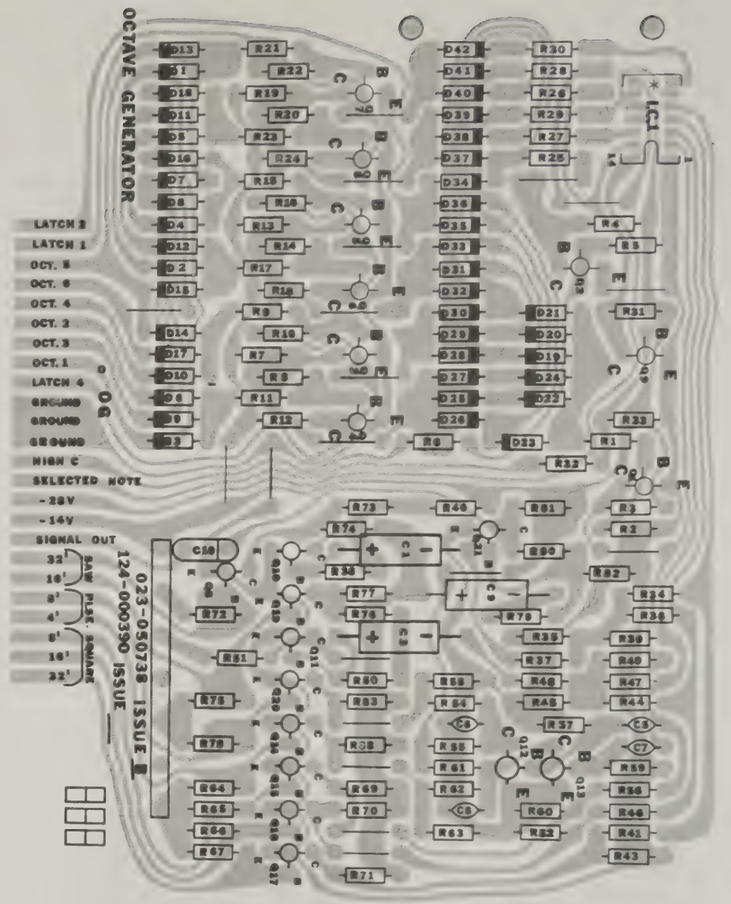
The output of
turn drives IC

3

FIGURE 3-6

NOTE GENERATOR BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000391)





* IC#1 EARLY UNITS 075-047298-001
CURRENT 075-000200

NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTORS ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITORS ARE IN MICROFARADS.
2. SYMBOL —○— INDICATES EDGE CONNECTOR TERMINAL AND IT'S NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
21	Q1 THRU Q21	001-021172	2N 4249
42	D1 THRU D42	001-026080	1N 4148
* 1	I.C. #1	001-047298-001	——

REVISIONS

124-000390

094-050743-A

OCTAVE GENERATOR 124-000390

The Octave Generator board generates squarewave outputs at 8, 16, and 32 foot pitches, staircase outputs at 16 and 32 foot pitches, and pulse outputs at 8 and 4 foot pitches* All outputs relate to the input frequency to the board, and are selected by application of DC control signals that gate on a particular octave, pitch, and waveform.

*Footages are musical terms, the fundamental pitch being 8 foot. A 4 foot signal will be twice the frequency, a 16 foot signal ½ the frequency, and a 32 foot signal ¼ the frequency of the 8 foot tone.

A squarewave input corresponding to the highest note within the highest octave played is applied to terminal 14 of the board. This signal is amplified and squared by Q9 and used to drive pin 13 of IC1. This signal is repeatedly divided-by-two to produce octavely related outputs on terminals 12, 10, 9, and 7 of IC1.

High C, the only note in octave six is brought in on board terminal 13, amplified and squared by Q2.

The signals on pins 13, 12, 10, 9, and 7 of IC1, and the high C signal from the collector of Q2 comprise the signals fed to the diode decoder D19 through D42.

Depending on the binary word stored in latches 1, 2, and 4, one-and-only-one of these signals will be gated through to amplifier Q1.

For example, if octave six is called for, a negative voltage will appear on board terminal 4. This voltage will set latches 2 and 4 and reset latch 1. Transistors Q7, Q6, and Q4 will be off, hence negative voltage will appear at these collectors. These negative collector voltages will back-bias diodes D37, D34, and D28 and allow the signal at the collector of Q2 to pass through diode D19 to the base of Q1. Examination will show that one or more of the decoder-diodes on every other line will be shorted to ground through a conducting latch transistor, and hence those signals will not appear at Q1. In a similar manner each octave called for will transmit one-and-only-one of the frequency inputs to the decoder matrix.

The selected signal at the base of Q1 is amplified and squared by Q1 and routed to terminal 2 of IC1. This signal is repeatedly divided-by-two to produce lower pitches at terminals 3, 4, and 5, of IC1. The squarewave signals at terminals 3, 4, and 5 of IC1 are mixed in a ¼, ½, and 1 ratio by resistors R34, R36, and R39 to produce a 32 foot sawtooth. This signal is amplified by Q10 and fed to the base amplifier Q21 through R73 and R74, providing that Q18 is turned off. Q18 functions as a shunt switch, holding the signal off until Q18 is turned off by connecting terminals 18 to ground.

The 16 foot sawtooth circuitry is similar to the 32 foot, using resistors R44, R47, and R49 as the mixing resistors, Q11 as the amplifier, and Q19 as the switch transistor.

The 32 foot squarewave signal at pin 5 of IC1 is isolated and attenuated by resistors R41 and R43 and fed to amplifier Q21 via R71. D17 functions as the switch transistor.

The 16 foot and 8 foot squarewave signals at terminals 3 and 4 of IC1 are processed in a manner similar to the 32 foot squarewave signal.

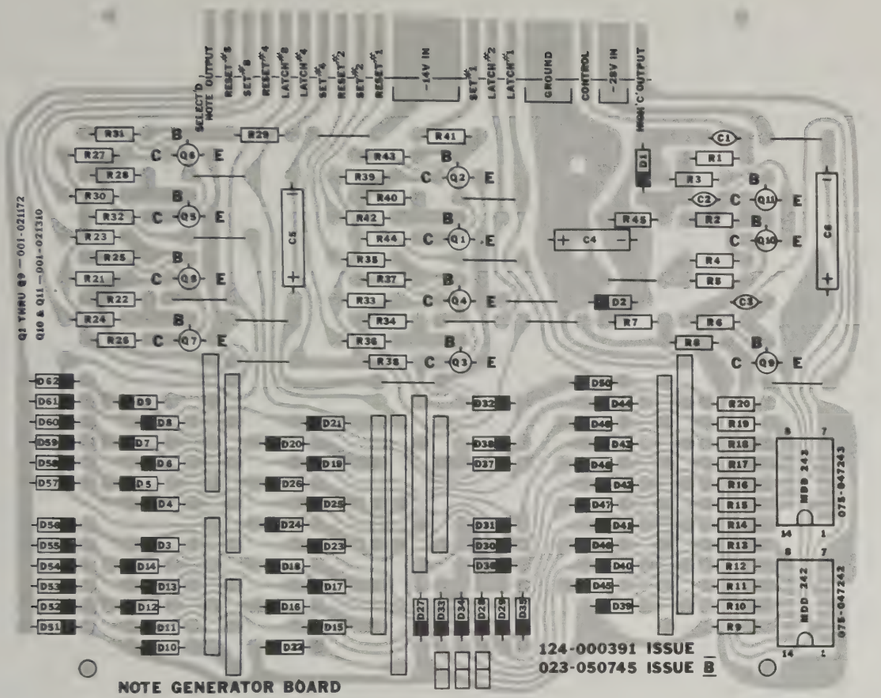
The 8 foot pulse waveform is generated by Q12 and associated components. Q12 is normally off, allowing C6 to charge toward -14 volts through R55. When the squarewave signal at pin 3 of IC1 goes negative, a pulse coupled through C5 to the base of Q12 turns Q12 on, and C6 discharges through Q12. The charge-discharge cycle repeats with each cycle of the squarewave. The pulse is coupled through R54 and R83 to amplifier Q21. Q20 serves as the switch transistor.

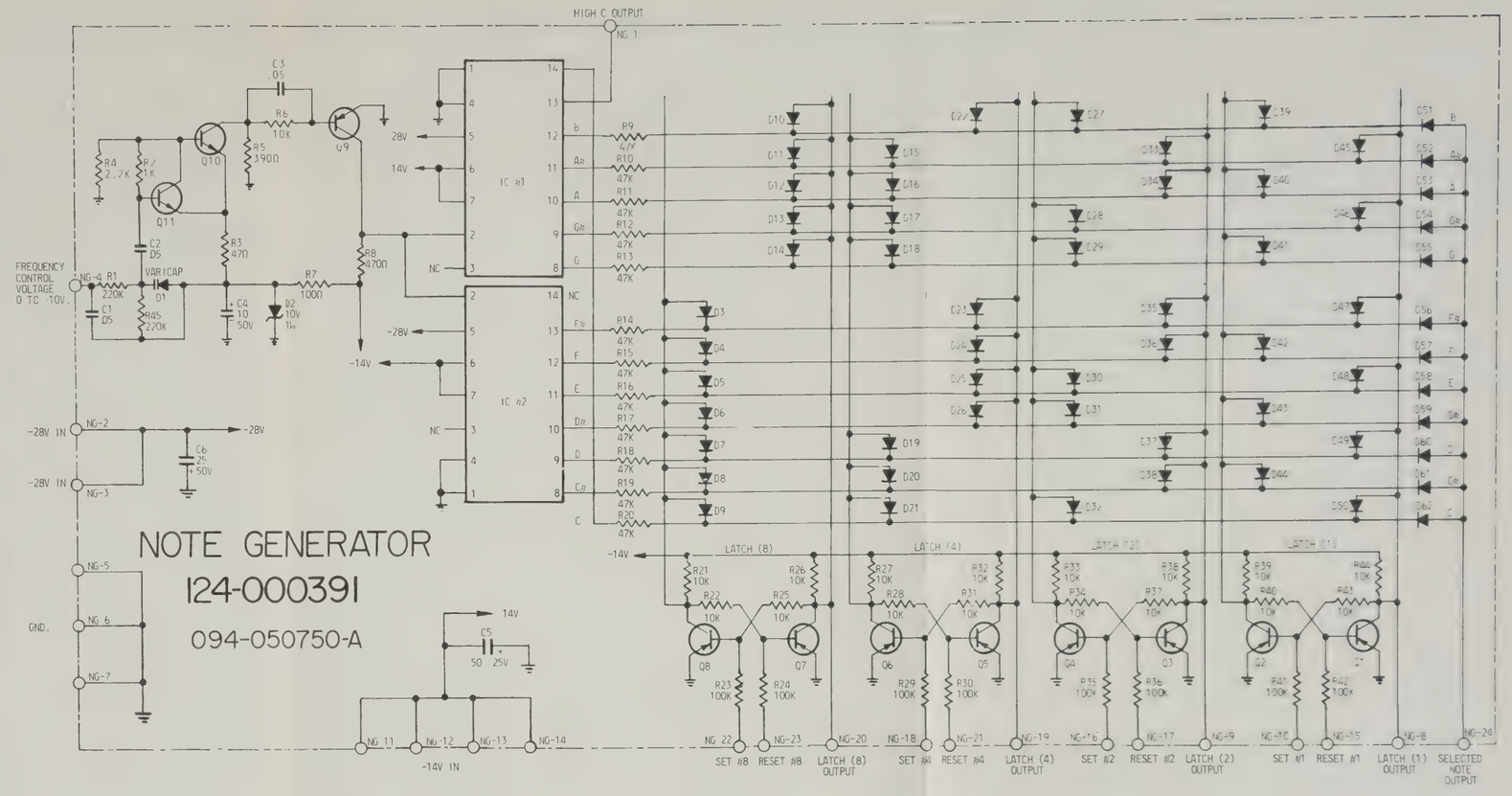
The 4 foot pulse is generated in a similar manner using Q13 as the discharge transistor and Q14 as the switch transistor.

2

FIGURE 3-5

OCTAVE GENERATOR BOARD SCHEMATIC, LAYOUT AND THEORY (124-000390)





NOTES:

1. UNLESS OTHERWISE NOTED:
   ALL RESISTOR VALUES ARE IN OHMS, ¼ WATT, ± 10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL NG-1 INDICATES EDGE CONNECTOR NG AND PIN NUMBER IN IT.

QTY	DESIGNATION SYMB.	HAMMOND PART #	JEDEC PART #
9	Q1 THRU Q9	001-021172	2N4249
2	Q10, Q11	001-021310	2N4123
1	D1	001-026130	MV1403
1	D2	001-023039	1N4740
60	D3 THRU D62	001-026080	1N4148
1	I.C. #1	075-047242	
1	I.C. #2	075-047243	

REVISIONS		
A	ADDED R45, R WAS 100K	

NOTE GENERATOR 124-000391

The Note Generator consists of a variable frequency oscillator controlled by a D.C. input that drives a two-package multiple derivative divider.

Four note latches accept and store binary encoded note information, decode this information, and bring the selected frequency to a common output line. The high C note (the only note in octave 6) is not included in the decoding, but instead is brought to a separate output terminal and treated as an octave by the octave generator board.

A binary encoded note word from the high select board is applied to set or reset terminals to establish the states of note latches 1, 2, 4, and 8.

Transistor Q10 and Q11 comprise a square wave oscillator with the frequency of oscillation being determined by the D.C. voltage present at board terminal 4.

The output of the oscillation drives Q9 which in turn drives IC1 and IC2. These two IC's divide the input by appropriate integers to produce outputs equal to the notes of the highest octave of musical tones used i.e., C through B. An additional output is provided for high C, the only note required in octave #6 of the manual keys. The 13 outputs of the divider comprise the signals fed to the diode decoder D3 through D62. Depending on the note word stored in latches 1,2,4, and 8, one and only-one of these signals will be gated through to board terminal 24.

For example, if note 1 (C) is called for, negative voltages will appear at board terminal 10 to "set" latch 1 and at terminals 17, 21, and 23 to "reset" latches 2,4, and 8. Transistors Q1, Q4, Q6, and Q8 will be off, hence negative voltages will appear at their collectors. These negative collector voltages will back bias diodes D9, D21, D32, and D50 and allow the C output from IC2 to pass through diode D62 to output terminals 24.

One or more of the decoder diodes on every other signal line will be connected to a conducting latch transistor, hence all signals except the desired one will be shorted to ground.

In a similar manner each binary note word applied to the latch inputs will select the corresponding note in the decoder matrix and route it to terminal 24. The high C note (on terminal 1) is not included in the decoder matrix but is selected by the octave generator board whenever high C (the only note in octave 6) is played.

3

FIGURE 3-6

NOTE GENERATOR BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000391)

se appearing at the
13 and coupled by di-
i D13 and C9. The
and D15, thus turning
ibrato signal. As C9
the vibrato signal.

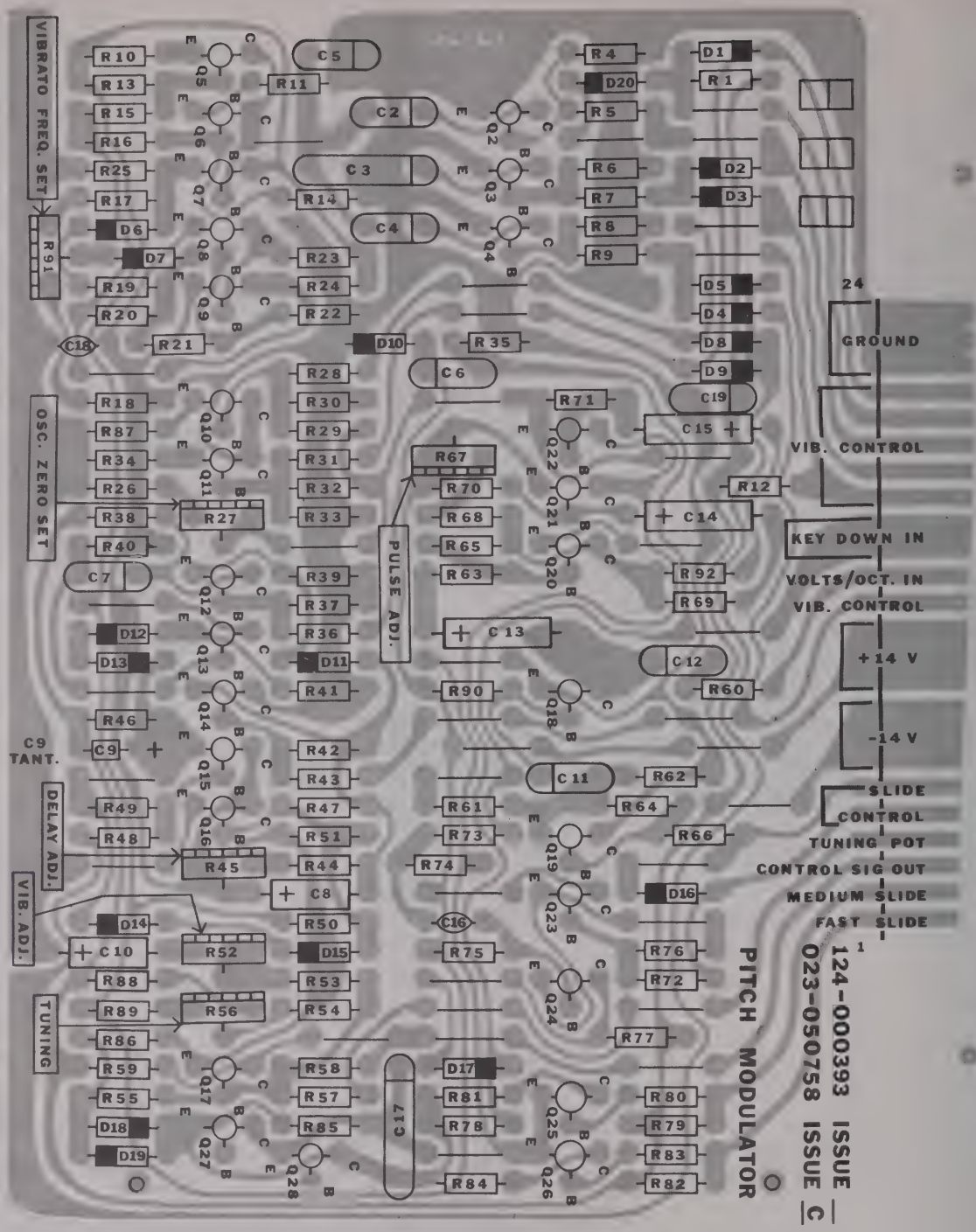
up slide by applying
Q23 is turned on. Pos-
3 on, a negative 28
ied and inverted by
or of Q24 is coupled
ltage on C17 is cou-
e of summing amplifi-
zener diodes to limit

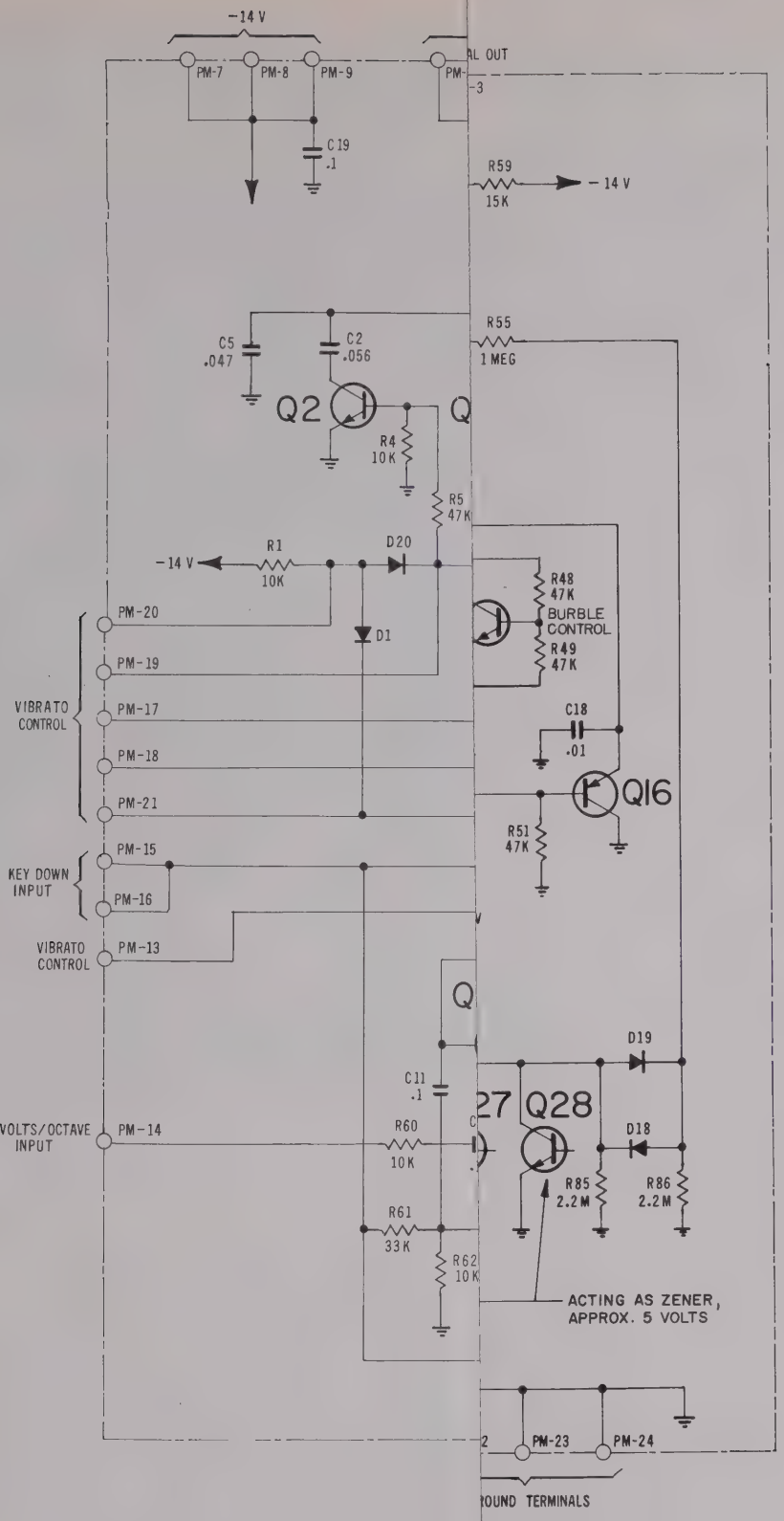
ide envelopes. Initial-
+14 volts and Q19 is
base lead. When a key
tive -28 volt step to pin
to terminal 14. The
s from a low to a higher
om a high to a low note.
h R61 and C11 to the
revent Q18 shorting the
from terminal 14 then
lified and inverted
a positive going
negative going change
ge of Q20 to approxi-
negative pulses.

i Q22 charge capacitor
i through diodes D18

bitch slide by con-
m slide Q25 is turned
allowing C17 to dis-
rned on allowing dis-

l at the base of Q17.
at the collector of
or a voltage control-





NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%
   ALL CAPACITOR VALUES ARE MICROFARADS.
2. SYMBOL—○— INDICATES EDGE CONNECTOR AND IT'S PIN NUMBER ON THE P.W. BOARD.

4

FIGURE 3-8

PITCH MODULATOR BOARD
SCHEMATIC
(124-000393)

PITCH MODULATOR 124-000393

The Pitch Modulator Board consists of a vibrato oscillator with means for controlling the rate, amplitude and mode of vibrato, and circuitry to generate both positive and negative pulse waveforms to create pitch slide effects. The vibrato and pitch slide waveforms, along with a D.C. tuning voltage are summed, the output being used as the control for a variable frequency oscillator.

Vibrato Oscillator

Q5 through Q9 comprise a triangular waveform vibrato oscillator. Q5 and Q6 are constant current circuits to linearly charge and discharge the main tuning capacitor C5, and auxiliary timing capacitors C2 through C4. Q7 is an emitter follower to minimize loading of the timing capacitors. Q8 and Q9 comprise a latch circuit to control the operation of the constant current circuits.

Assume that Q9 initially is conducting. With Q9 conducting the collector of Q9 is essentially at ground, turning off Q6 and turning on Q5. Under this condition the tuning capacitor(s) charge linearly toward +14 volts. When the emitter of Q7 (which follows the voltage on the tuning capacitor(s) reaches approximately +10 volts, Q8 turns on and Q9 turns off making the collector of Q9 rise to +14 volts. This +14 collector voltage turns Q5 off and Q6 on and the tuning capacitor(s) discharge linearly through Q6. As the voltage at the emitter of Q7 drops, latch transistor Q8 turns off, Q9 turns on and the cycle repeats. The frequency of this oscillator is varied by adjusting R91.

Tuning capacitor C5 is in the circuit at all times. Auxiliary capacitors C2 through C4 are placed in the circuit by control voltages applied to the bases of Q2 through Q4 to produce a variety of vibrato oscillator frequencies.

Resistors R25, R26 and potentiometer R27 center the positive and negative swings of the vibrato oscillator around ground at the junction of R25 and R26.

Transistors Q10 and Q11 switch in resistors R87 and R34 respectively to reduce the amplitude of the vibrato oscillator output.

Delayed Vibrato and Burble

The delayed vibrato functions as follows:

A negative 28 volt key down input is differentiated by C6, R36, and R37 and applied to the base of Q12. The negative pulse at the emitter of Q12 is coupled by diode Q11 to C8. D11 prevents discharge of C8 through R39. The voltage on C8 turns on Q16 which in turn shorts out the vibrato oscillator signal.

As the charge on C8 dissipates, Q16 turns off allowing the vibrato oscillator signal to pass through C10, R52, and R53 to the base of summing amplifier Q17. When delayed vibrato is not called for, Q14 is turned on shorting the voltage on C8 to ground.

For burble, Q15 is off the Q16 is held on through diodes D14 and D15 and resistor R46. The positive going pulse appearing at the collector of Q12 is referenced to ground by Q13 and coupled by diodes D12 and D13 and coupled by diodes D12 and D13 and C9. The positive charge on C9 back-biases diodes D14 and D15, thus turning Q16 off, releasing the short circuit on the vibrato signal. As C9 discharges, Q16 turns on, again shorting out the vibrato signal.

Up-Pitch Slide

Q23 is used as the control transistor for the up slide by applying positive 14 volts to the emitter of Q24 when Q23 is turned on. Positive voltage on pin 5 turns Q23 on. With Q23 on, a negative 28 volt key down signal on terminal 15 is amplified and inverted by Q24. The positive going pulse at the collector of Q24 is coupled by diode D17 to charge capacitor C17. The voltage on C17 is coupled by diode D19 and resistor R55 to the base of summing amplifier Q17. Transistors Q27 and Q28 function as zener diodes to limit the charge on C17.

Up-Down Pitch Slide

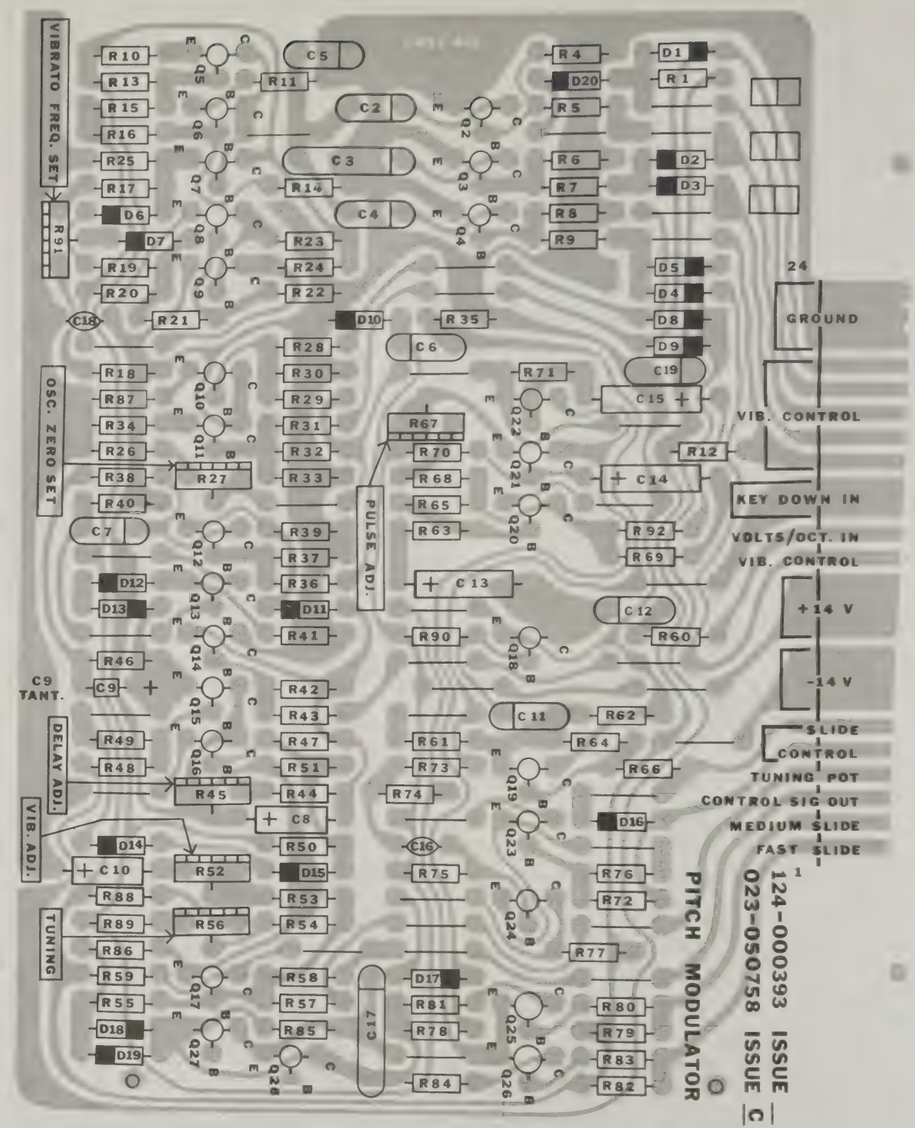
Q81 through Q22 generate the up-down pitch slide envelopes. Initially Q18 is on, its base lead being returned to +14 volts and Q19 is off, no control voltage being applied to its base lead. When a key is played two inputs are applied; (1) a negative -28 volt step to pin 15 and (2) a positive or negative voltage step to terminal 14. The step will be positive going when the change is from a low to a higher note, and the negative going with a change from a high to a low note. The negative step on pin 15 is coupled through R61 and C11 to the base of Q18, turning Q18 off long enough to prevent Q18 shorting the signal on terminal 14 to ground. The signal from terminal 14 then passes to the base of amplifier Q20. The amplified and inverted pulse at the collector of Q20 turns on Q21 for a positive going change at terminal 14, and turns on Q22 for a negative going change at terminal 14. R67 sets the collector voltage of Q20 to approximately 7 volts, to insure equal positive and negative pulses.

The pulses at the common collectors of Q21 and Q22 charge capacitor C17 through R78. The charge on C17 is coupled through diodes D18 or D19, and R55 to the summing amplifier Q17.

Transistors Q25 and Q26 control the speed of pitch slide by controlling the discharge rate of C17. For medium slide Q25 is turned on by application of +14 volts to terminal 2, allowing C17 to discharge through R81. For fast slide Q26 is turned on allowing discharge through R84.

Summing Amp

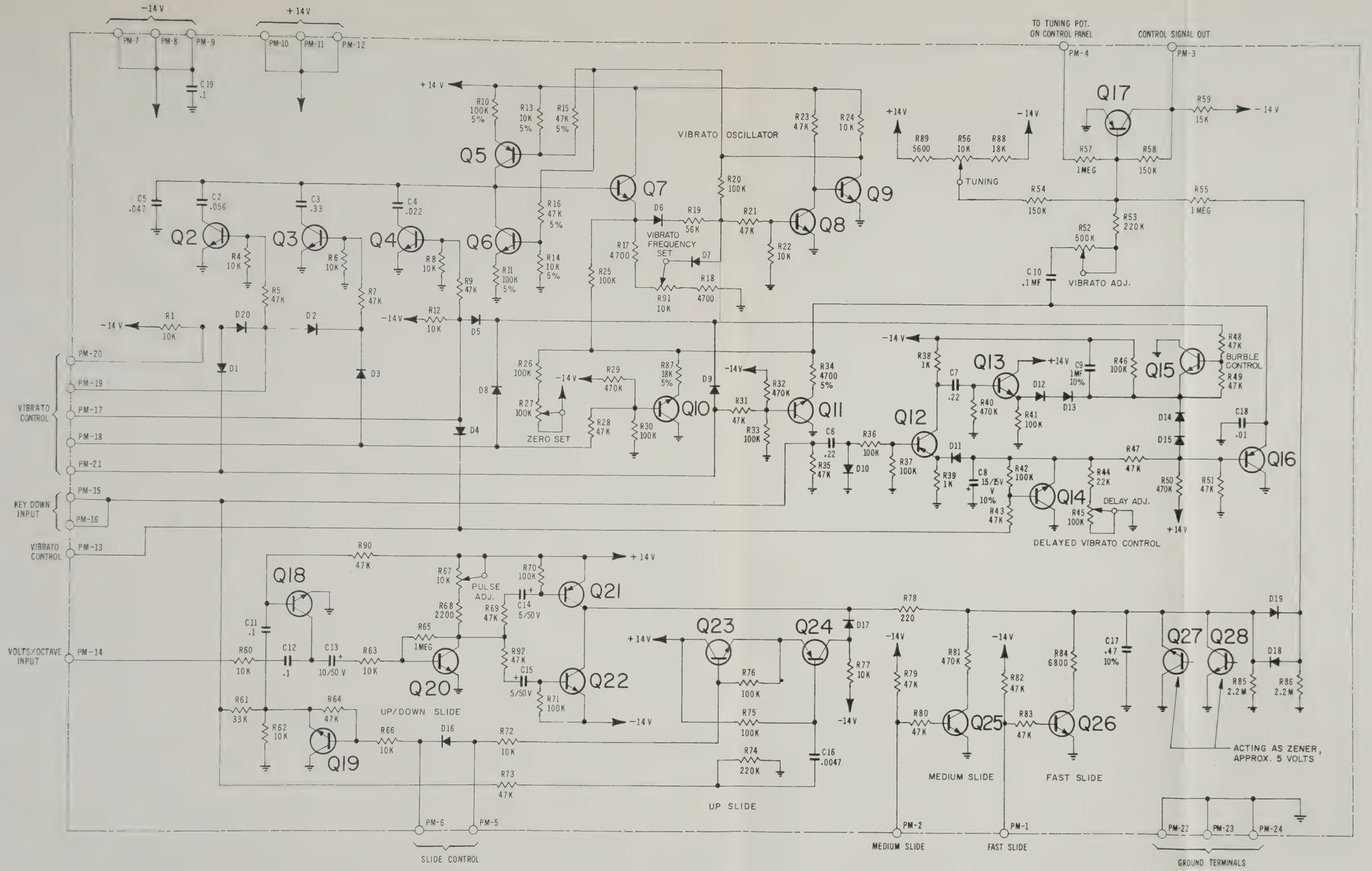
The vibrato and pitch slide signals are summed at the base of Q17. Q17 amplifies the summed signals. The output at the collector of Q17 is used as the frequency control siganl for a voltage controlled oscillator on another board.



4

FIGURE 3-7

PITCH MODULATOR BOARD
LAYOUT AND THEORY
(124-000393)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE MICROFARADS.
2. SYMBOL —○— INDICATES EDGE CONNECTOR AND IT'S PIN NUMBER ON THE P.W. BOARD.

VIBRATO SWITCH POSITION	TERMINAL 13	Q16 BASE	Q15 BASE
1- OFF	0 V	-.7 V	-1.5 V
2- VIBRATO	+14 V	+.7 V	+.7 V
3- VIBRATO	+14 V	+.7 V	+.7 V
4- DELAY VIBRATO	0 V	+.7 V	+.7 V
5- DELAY VIBRATO	0 V	+.7 V	+.7 V
6- VIBRATO	+14 V	+.7 V	+.7 V
7- BURBLE	+14 V	-.7 V	-1.5 V

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
21	Q2,Q3,Q4,Q6,Q8 THRU Q11,Q13,Q14, Q15,Q18 THRU Q20,Q22,Q23,Q25 THRU28	001-021134	2N 3394
6	Q5,Q12,Q16,Q17,Q21 & Q24	001-021173	2N 4249
1	Q7	001-021135	2N 3394
20	D1 THRU D20	001-026080	1N 4148

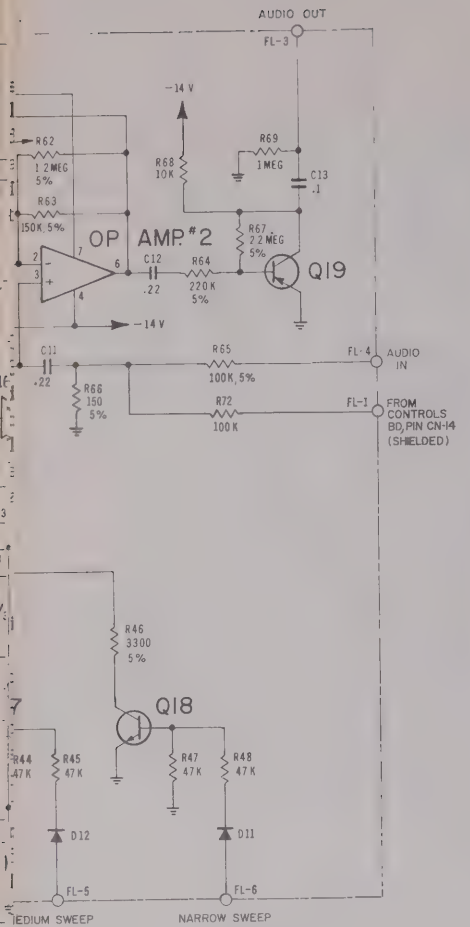
PITCH MODULATOR BOARD
124-000393
094-050763-A

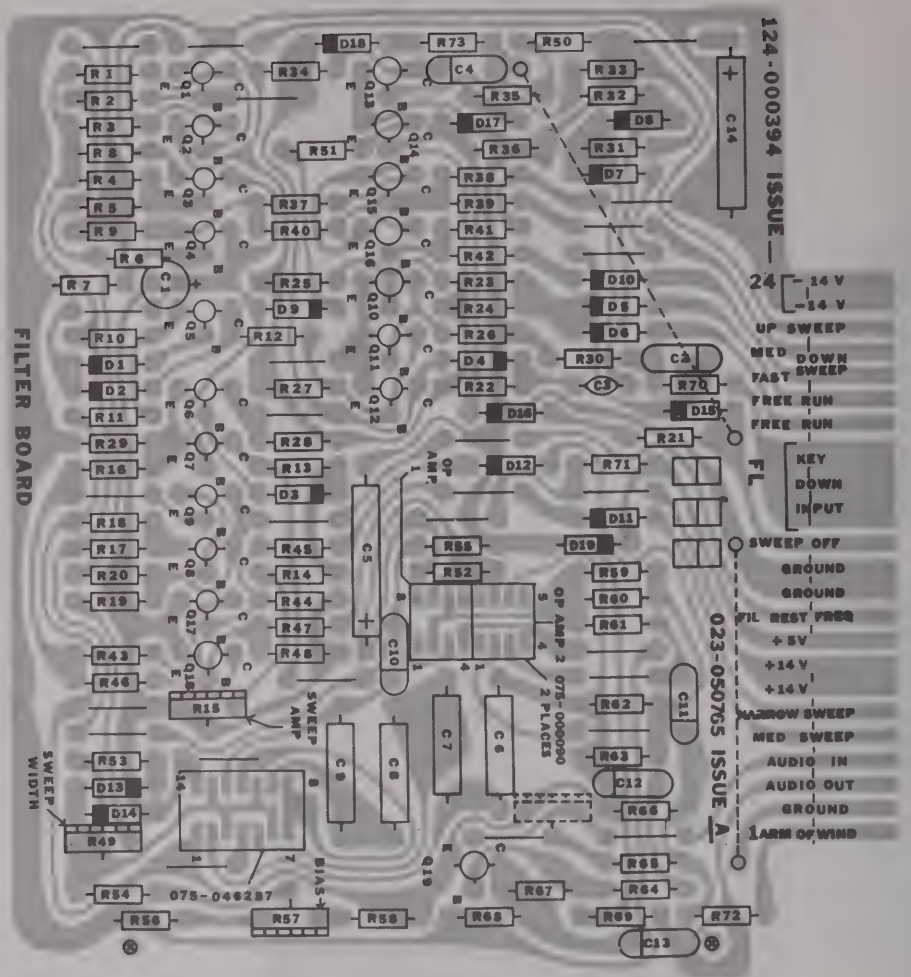
REVISIONS

4

FIGURE 3-8

PITCH MODULATOR BOARD
SCHEMATIC
(124-000393)





erational amplifier 2 provides a gain which is control-
egative feedback to its pin 2. The audio input signal
erminal FL-4 is attenuated by resistors R65 and R66 to
loading IC 1, and is fed to the non-inverting input of
n 3). Q19 restores the signal to full amplitude. Di-
D14 are used to offset the temperature drift of IC 1.

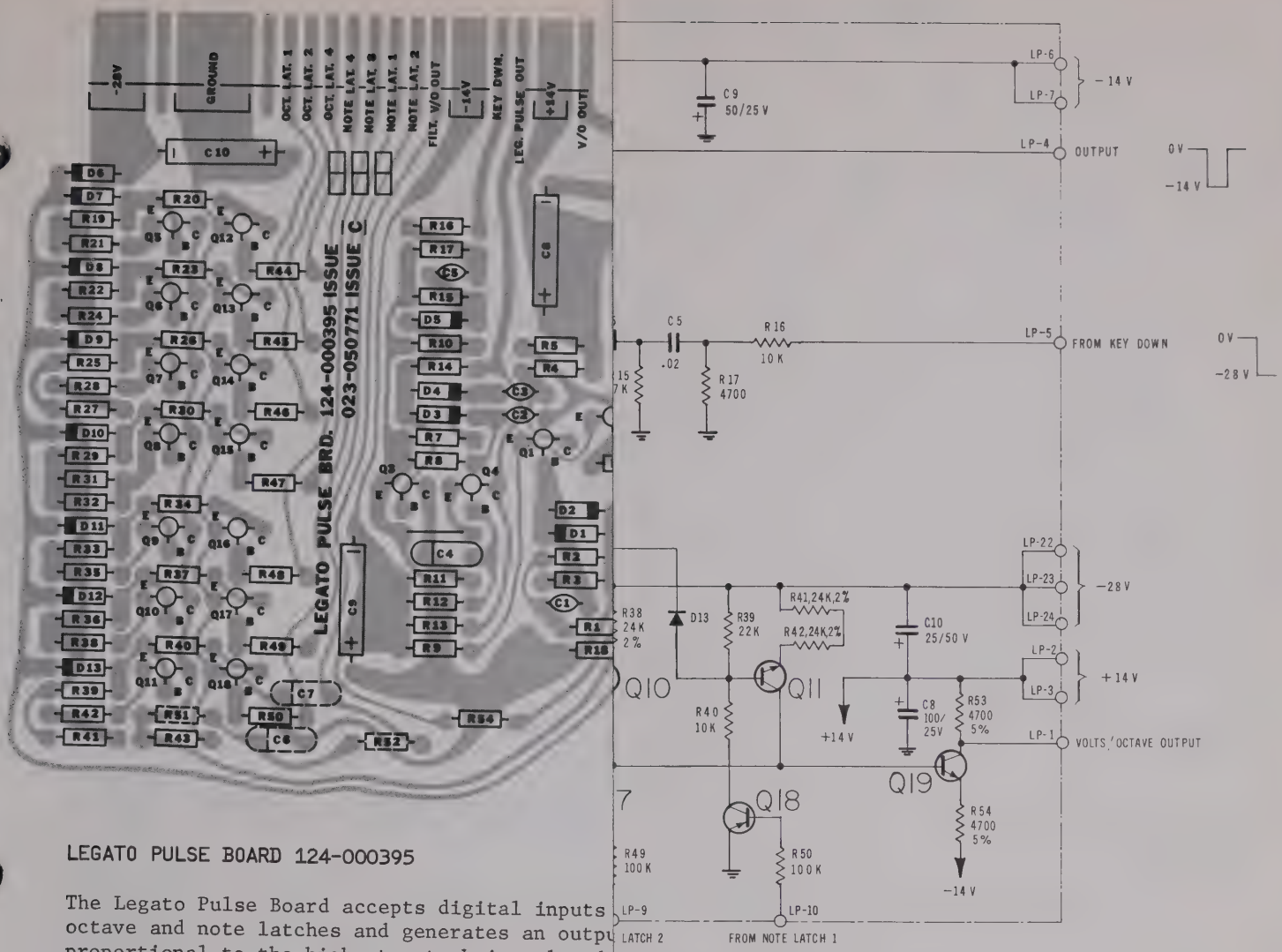
n
mQ1 through Q4 and their associated circuitry comprise an
roducing a triangular waveform which is used to sweep
controlled filter. When no sweep waveform is desired, a
tage is applied to terminal FL-13. This voltage is fed
and R73 to the base of Q1, turning Q1 on and Q2 off, in-
the flip-flop is in its proper (low) state at rest. The
QL-13 is also coupled by R21 and D16 to the base of Q14,
en and holding C1 in a discharged state through D9, R51,
1rated Q14. The voltage at FL-13 is also fed through D15
ias D7 and D8, preventing any triggering of the following
g the key down pulse.

rm a flip-flop which can be made either astable or mono-
t shot operation of the triangular oscillator occurs when
ntage is removed from terminals Fl-13, Fl-18, and FL-19.
m step at terminals FL-14 through Fl-17 is differentiated
_1. The resulting key down pulse is coupled to the base of
rily turning it on, producting a positive-going pulse at
r, which is coupled through C4, R35, and D17 to the base
h turns on long enough to discharge C1. The flip-flop is
state with Q1 on. The differentiated key down pulse is
18, C3, and D4 to the base of Q1, turning it off and Q2 on,
o begin charging positive through the saturated Q3. C1
l the emitter of Q7 is sufficiently positive to turn on
off Q1 and changing the state of the flip-flop. This
turns on Q4 and initiates discharge of C1. Q10 is in its normal off state, since no positive voltage is applied to terminal FL-18 or FL-19. Q11 in turn is on, preventing Q12 from turning on, regardless of the collector voltage of Q5. The ramp now remains in its rest state until another key down pulse is applied to the circuit.

If free-running operation is desired, positive voltage is applied to terminal FL-18 or FL-19. This voltage is fed through D5 or D6, turning Q10 on. This shorts the base of Q11 to its emitter, turning it off. When the triangular waveform at collectors of Q3 and Q4 is sufficiently negative to pass D1, Q5 turns on to provide a ground to the base of Q12, turning Q12 on. (D2 is included to prevent C1 from taking on a negative charge.) The negative voltage now at the base of Q1 turns it off, allowing C1 again to charge toward the positive source, this cycle continuing as long as there is positive voltage to terminal FL-18 or FL-19.

The rise time of the ramp waveform is dependent chiefly on the emitter resistance of Q3. This is varied by switching resistance across R8 at terminal FL-22. The fall time is a function principally of the resistance in the emitter of Q4. For medium fall time, a positive voltage is applied to terminal FL-21, turning Q15 on, and placing R37 effectively in parallel with R9. For fast fall time, positive voltage applied to terminal FL-20, turning on Q16, and shunting R40 across R9. The amplitude of the triangular waveform can be attenuated by connecting a positive voltage to either terminal FL-5 or FL-6. This turns on Q17 or Q18 respectively, connecting either R43 or R46 from the base of Q9 to ground. Transistors Q8 and Q9 serve to amplify the ramp waveform and apply it to the gates of the FET's of IC 1.

A zener regulated +5 volt supply derived from the +14 volt supply is available at terminals FL-9. The resonant point of the voltage controlled filter is set by switching resistance values between terminals FL-9 and FL-10.



LEGATO PULSE BOARD 124-000395

The Legato Pulse Board accepts digital inputs
octave and note latches and generates an outpu
proportional to the highest note being played.
transition from one voltage level to another t
curs when the digital note and/or octave infor
changes is used to control the up-down pitch s
fect. The board also generates a negative 14
each time a new high note is played, or whenev
same note is played repeatedly. This output p
used to energize the percussion-mode keyers.

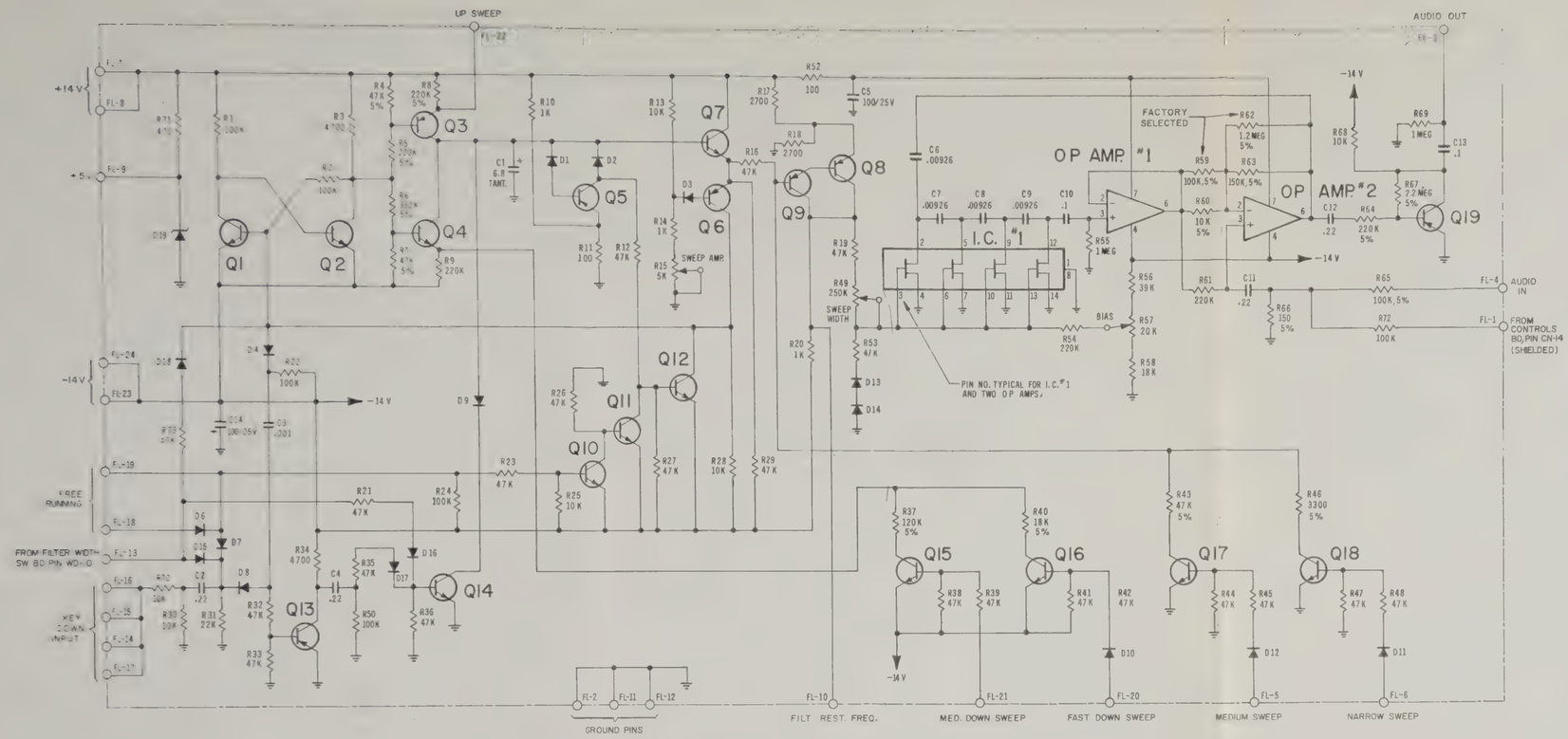
Transistors Q12 through Q18 function as D.C. s
which turn on when negative voltage signals fr
note and octave latches are applied to their b
The set state of the latches turn these transi
Transistors Q5 through Q11 are constant-curren
tors with emitter resistors selected in the ra
1:2:4:6:12:24:48. When binary note and octave
are applied, the appropriate constant-current
turn on. Diodes D7 through D13 clamp the base
constant-current transistor to one junction ab
reference voltage established by zener diode D
all constant-current transistors are biased on
voltage, The current contributions are summed
resistor R43 to produce a voltage at the base
proportional to the note and octave being playe
voltage is inverted by Q19 and appears as an ou
at board terminal 1. The change in voltage app
at R43 that occurs whenever a new note and/or
word is applied to the latch inputs is differen
C1 and R3 and applied to the base of Q1. Diode
and D2 limit the input step to approximately 0.
maximum to prevent overdriving Q1.

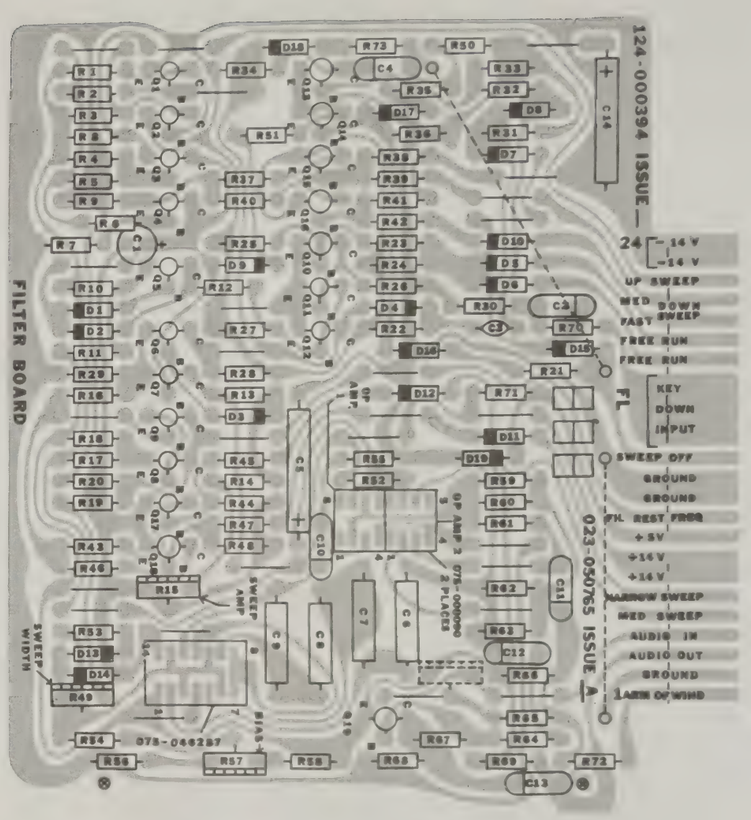
REVISIONS

6

FIGURE 3-10

LEGATO PULSE BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000395)





NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL —O— INDICATES EDGE CONNECTOR PIN NUMBER.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
12	Q1,Q2,Q4,Q7,Q10,Q11,Q12,Q14 THRU 18	001-021134	2N3394
7	Q3,Q5,Q6,Q8,Q9,Q13,Q19	001-021173	2N4249
18	D1 THRU D18	001-026080	1N4148
1	D19 (1W, 5V ZENER)	001-023030	1N4733
1	I.C. #1	075-046287	———
2	OP AMP. #1 & #2	075-000090	———

FILTER BOARD 124-000394
094-050770-A

REVISIONS

5

FIGURE 3-9

FILTER BOARD - SCHEMATIC, LAYOUT AND THEORY (124--000394

FILTER BOARD 124-000394

The 124-000394 Filter Board consists of a voltage controlled filter, plus an oscillator to provide a sweeping voltage to the filter. Control of the filter and oscillator sections is provided by means of external switching systems.

The voltage controlled filter, consisting of IC 1 and operational amplifiers 1 and 2, is basically a four-stage R-C phase shift oscillator. The gain in the feedback loop is limited to a point safely below oscillation, resulting in a 12 to 16 decibel peak in the response at the point where there is 180° of phase shift through the network. At frequencies below this resonant point, there is a high degree of attenuation through the R-C network (C6 through C9 and IC 1), and the gain is constant, determined by the ratio of R62 and R63 to R59 and R60. (This gain can be increased by removing R62, and decreased by removing R59.) At frequencies above the resonant point, capacitors C6 through C9 approach a short circuit, resulting in 100% negative feedback, and greatly attenuating these higher frequencies.

The field effect transistors in IC 1 are used as voltage-variable resistors. The resistance between drain and source varies in proportion to the voltage on the gates of the FET's, changing the R portion of the R-C phase shift network. Thus, the resonant point of the filter can be tuned to a desired frequency by applying the proper voltage to the FET gates. When a sweep signal is applied to the gates by Q8, the filter can be swept through any desired range of frequencies. External resistors connected between terminal FL10 and a plus voltage supply (+5volts) are used to shift the rest position of the filter.

Operational amplifier 1 is connected for unity gain and is employed as a buffer stage to obtain high input impedance with low offset voltage. Operational amplifier 2 provides a gain which is controlled by the negative feedback to its pin 2. The audio input signal present at terminal FL-4 is attenuated by resistors R65 and R66 to prevent overloading IC 1, and is fed to the non-inverting input of Op Amp 2 (pin 3). Q19 restores the signal to full amplitude. Diodes D13 and D14 are used to offset the temperature drift of IC 1.

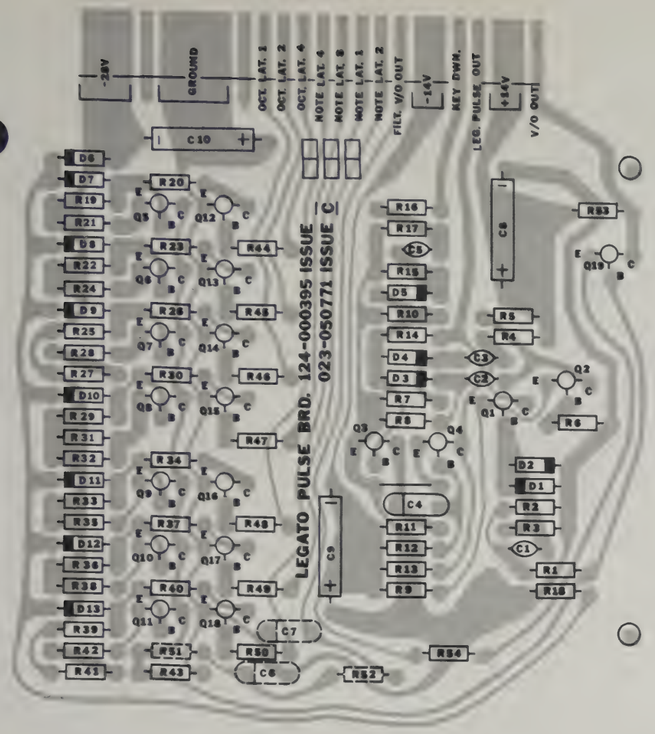
Transistors Q1 through Q4 and their associated circuitry comprise an oscillator producing a triangular waveform which is used to sweep the voltage controlled filter. When no sweep waveform is desired, a positive voltage is applied to terminal FL-13. This voltage is fed through D18 and R73 to the base of Q1, turning Q1 on and Q2 off, insuring that the flip-flop is in its proper (low) state at rest. The voltage at FL-13 is also coupled by R21 and D16 to the base of Q14, turning it on and holding C1 in a discharged state through D9, R51, and the saturated Q14. The voltage at FL-13 is also fed through D15 to reverse bias D7 and D8, preventing any triggering of the following circuitry by the key down pulse.

Q1 and Q2 form a flip-flop which can be made either astable or monostable. One shot operation of the triangular oscillator occurs when positive voltage is removed from terminals Fl-13, Fl-18, and FL-19. The key down step at terminals FL-14 through Fl-17 is differentiated by C2 and R31. The resulting key down pulse is coupled to the base of Q13, momentarily turning it on, producting a positive-going pulse at its collector, which is coupled through C4, R35, and D17 to the base of Q14, which turns on long enough to discharge C1. The flip-flop is in its rest state with Q1 on. The differentiated key down pulse is coupled by D8, C3, and D4 to the base of Q1, turning it off and Q2 on, causing C1 to begin charging positive through the saturated Q3. C1 charges until the emitter of Q7 is sufficiently positive to turn on Q6, turning off Q1 and changing the state of the flip-flop. This turns on Q4 and initiates discharge of C1. Q10 is in its normal off state, since no positive voltage is applied to terminal FL-18 or FL-19. Q11 in turn is on, preventing Q12 from turning on, regardless of the collector voltage of Q5. The ramp now remains in its rest state until another key down pulse is applied to the circuit.

If free-running operation is desired, positive voltage is applied to terminal FL-18 or FL-19. This voltage is fed through D5 or D6, turning Q10 on. This shorts the base of Q11 to its emitter, turning it off. When the triangular waveform at collectors of Q3 and Q4 is sufficiently negative to pass D1, Q5 turns on to provide a ground to the base of Q12, turning Q12 on. (D2 is included to prevent C1 from taking on a negative charge.) The negative voltage now at the base of Q1 turns it off, allowing C1 again to charge toward the positive source, this cycle continuing as long as there is positive voltage to terminal FL-18 or FL-19.

The rise time of the ramp waveform is dependent chiefly on the emitter resistance of Q3. This is varied by switching resistance across R8 at terminal FL-22. The fall time is a function principally of the resistance in the emitter of Q4. For medium fall time, a positive voltage is applied to terminal FL-21, turning Q15 on, and placing R37 effectively in parallel with R9. For fast fall time, positive voltage applied to terminal FL-20, turning on Q16, and shunting R40 across R9. The amplitude of the triangular waveform can be attenuated by connecting a positive voltage to either terminal FL-5 or FL-6. This turns on Q17 or Q18 respectively, connecting either R43 or R46 from the base of Q9 to ground. Transistors Q8 and Q9 serve to amplify the ramp waveform and apply it to the gates of the FET's of IC 1.

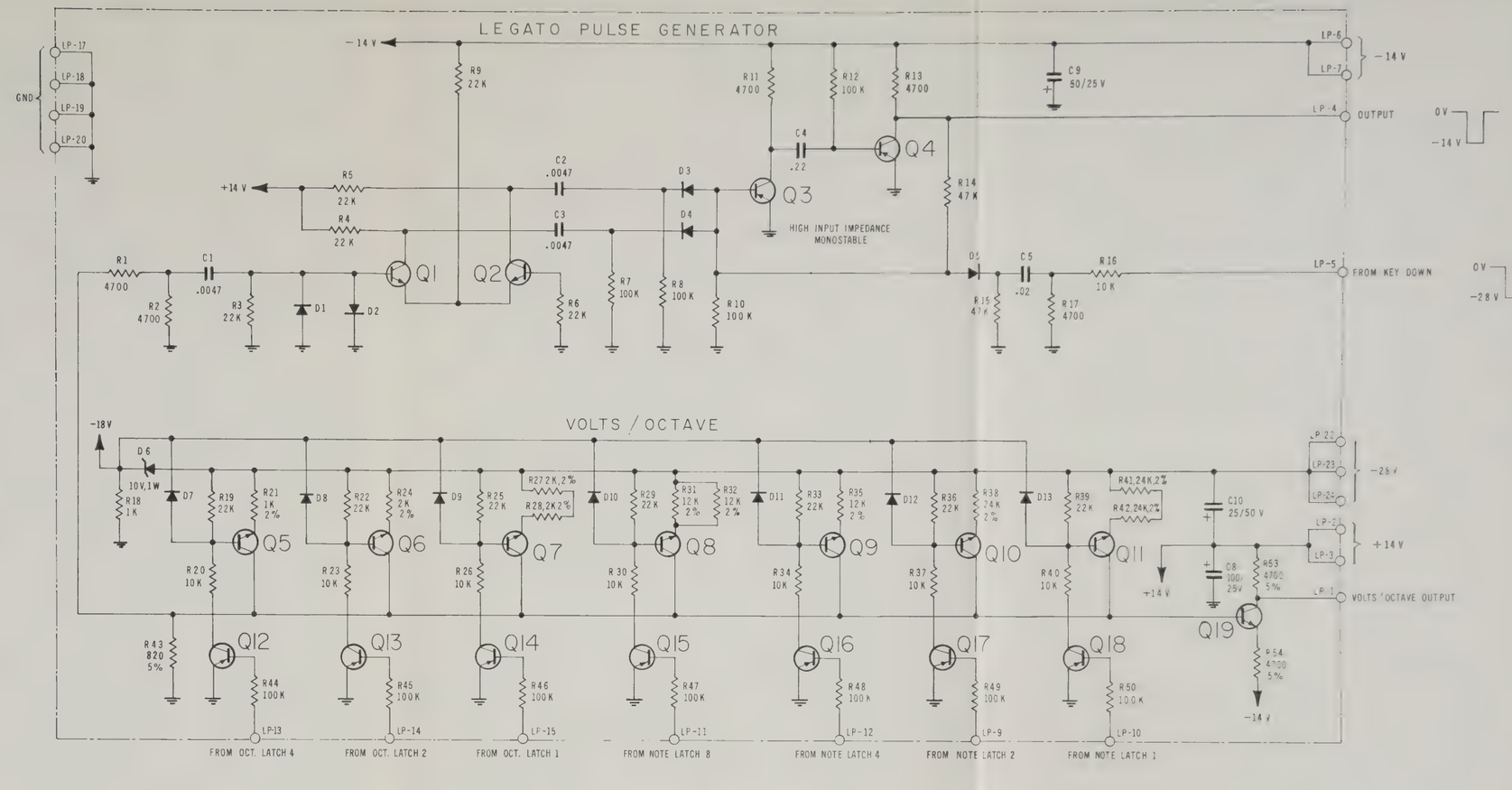
A zener regulated +5 volt supply derived from the +14 volt supply is available at terminals FL-9. The resonant point of the voltage controlled filter is set by switching resistance values between terminals FL-9 and FL-10.



LEGATO PULSE BOARD 124-000395

The Legato Pulse Board accepts digital inputs from the octave and note latches and generates an output voltage proportional to the highest note being played. The transition from one voltage level to another that occurs when the digital note and/or octave information changes is used to control the up-down pitch slide effect. The board also generates a negative 14 volt pulse each time a new high note is played, or whenever the same note is played repeatedly. This output pulse is used to energize the percussion-mode keyers.

Transistors Q12 through Q18 function as D.C. switches which turn on when negative voltage signals from the note and octave latches are applied to their base leads. The set state of the latches turn these transistors on. Transistors Q5 through Q11 are constant-current generators with emitter resistors selected in the ratio of 1:2:4:6:12:24:48. When binary note and octave words* are applied, the appropriate constant-current generators turn on. Diodes D7 through D13 clamp the bases of the constant-current transistor to one junction above the reference voltage established by zener diode D6, so that all constant-current transistors are biased on by a like voltage, The current contributions are summed in resistor R43 to produce a voltage at the base of Q19 proportional to the note and octave being played. This voltage is inverted by Q19 and appears as an output at board terminal 1. The change in voltage appearing at R43 that occurs whenever a new note and/or octave word is applied to the latch inputs is differentiated by C1 and R3 and applied to the base of Q1. Diodes D1 and D2 limit the input step to approximately 0.7 volts maximum to prevent overdriving Q1.



NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 W, ±10 %;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL —○— LP-3 INDICATES PIN NUMBER IN EDGE CONNECTOR LP.

QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
10	Q1,Q2,Q5 THRU Q11 & Q 19	001-021134	2N 3394
9	Q3,Q4,Q12 THRU Q18	001-021172	2N 4249
12	D1 THRU D5 & D7 THRU D13	001-026080	1N 4148
1	D6 (10V, 1W)	001-023039	1N 4740

LEGATO PULSE BOARD
124-000395
094-050776-0

REVISIONS

Q1 and Q2 function as a phase splitter such that Q1 will have a negative pulse at its collector when the input is positive going, and Q2 will have a negative pulse at its collector when the input is negative going. These negative going pulse signals are transmitted by diodes D3 and D4 to the base of Q3. Q3 and Q4 function as a monostable multivibrator to produce a negative going, 14 volt pulse at board terminal 4. This pulse is used to charge the time constant capacitor in the percussion keying mode.

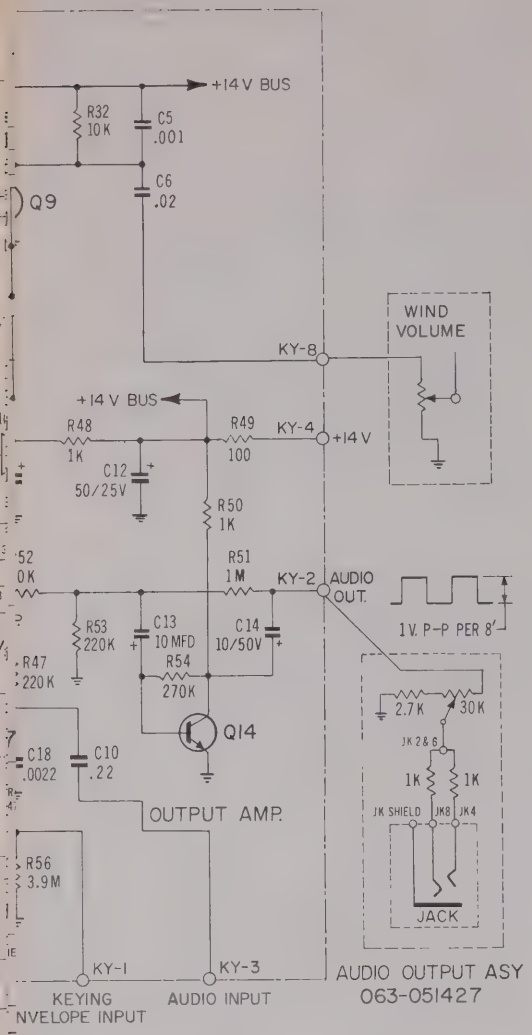
In the case where the same note is played repeatedly, no change occures in the note and octave latches, hence no voltage steps occur at R43 and no output pulse would be generated by the monostable to energize the percussion keyer. For this case a key down signal is brought in on board terminal 5. This signal is accentuated by R16 and R17, differentiated by C5 and R15, and transmitted by diodes D5 to the base of Q3 to trigger the monostable, thus generating the required output pulse.

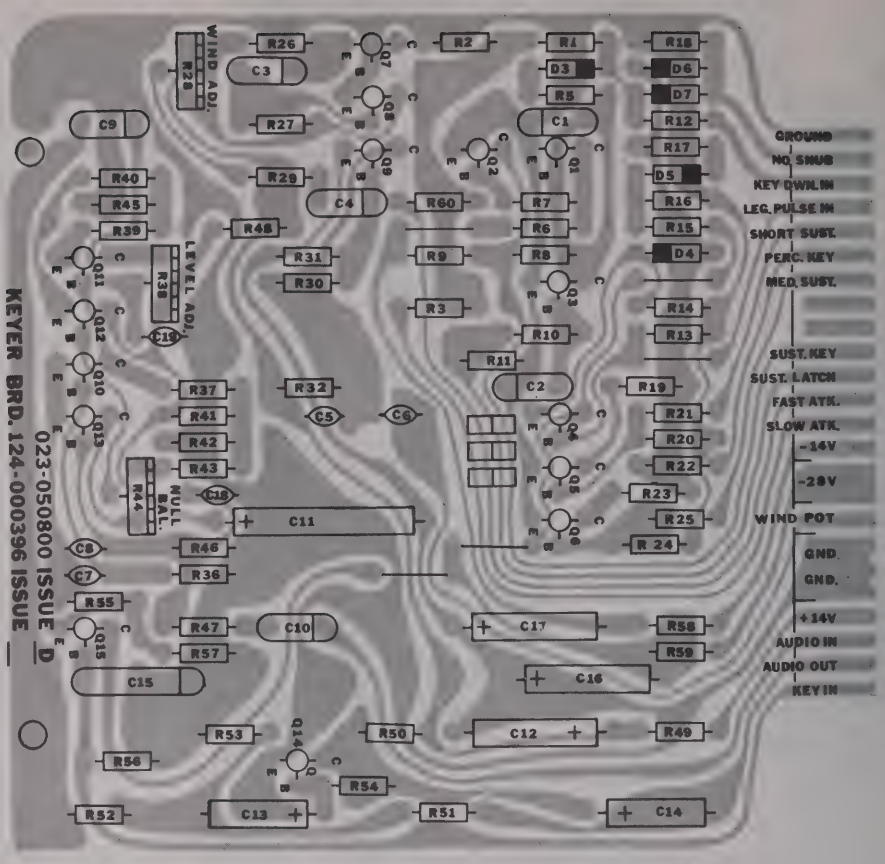
(* Keying output from the octave and note latch circuits.)

6

FIGURE 3-10

LEGATO PULSE BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000395)





ent keying envelopes may be generated and applied
enal switching to the keying input, terminal 1.

1

ack/decay (terminals 12 connected to terminal 1).
.t key down signal at terminal 22 is accenuated by R12, R1
d transmitted through resistor R3 to charge capacitor C15.
ase of the keying voltage, C1 discharges primarily through
d.

t

ack/decay (terminal 13 connected to terminal 1).
n is similar to above except that R60 becomes the con-
resistor for charging C15, while the discharge of C15 is
60 and R2.

1

comprise a bistable latch. Prior to pressing the soste-
ch -28 volt is present at terminal 14 holding Q3 on, Q1
2 on. Negative keying signals brought to the base of Q1
D3 and R5 will be shorted to ground through Q3 and will
t the state of latch transistors Q1 and Q2. When the
switch is pressed, the voltage is removed from terminal
turns off. Thereafter, the first input from the key
will turn Q1 on which, in turn, turns Q2 off and a neg-
tage appears at the collector of Q2 to charge C15. In
the keyed tone sounds continuously (but changes in fre-
th new notes played) until such time that another keying
elected. Upon selection of an alternate keying mode,
is reapplied to terminal 14 and latch transistor Q1 and
to their initial states.

4. Percussion - Long Sustain - No Snubbing (terminal 19 connected to terminal 1)

   A negative pulse at terminal 21 is buffered by Q4 and charges capacitor C15 through resistor R22. C15 starts to discharge immediately, first primarily through R17 to a voltage level established by R15 and R16. When the charge on C15 becomes less negative than the voltage at the junction of R15 and R16, diode D5 blocks further discharge through R17 to a voltage level established by R15 and R16. When the charge on C15 becomes less negative than the voltage at the junction of R15 and R16, diode D5 blocks further discharge through R17 and the discharge continues at a slower rate through R56. Throughout the cycle, discharge through R18 is prevented by applying back bias to diode D6 via terminal 23.

5. Percussion - Long Sustain - With Snubbing (terminal 19 connected to terminal 1)

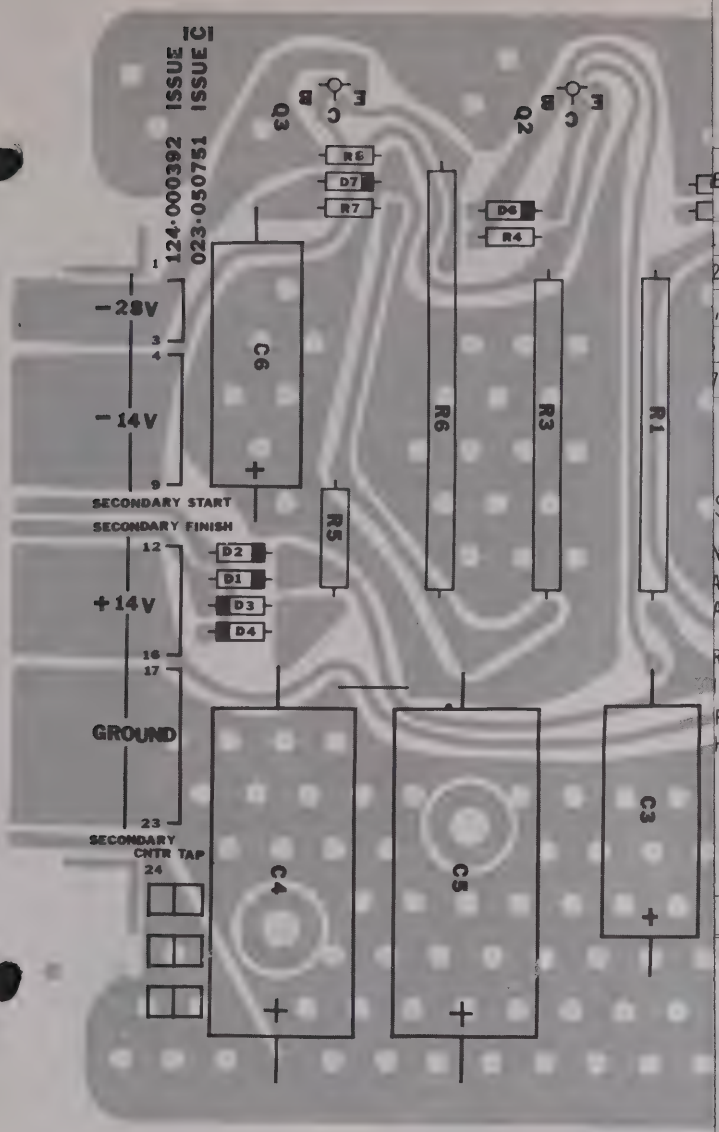
   The operation is similar to the above except no voltage is present at terminal 23. The back bias for D6 is derived from the key down input line through D7. Hence, when all keys are released, no biasing voltage is present at the anode of D6 and the remaining charge on C15, if any, dissipates rapidly through R18.

6. Percussion - Medium Sustain

   The operation is similar to paragraph 4 above except that Q6 is turned on by application of a negative voltage to terminal 18. R23 affords a second discharge path in parallel with R56 resulting in a shorter decay time.

7. Percussion - Short Sustain

   Similar to paragraph 5 above except that voltage at terminal 20 turns on transistor Q5, placing R19 in parallel with R56. Q6 is left in an off condition.



ESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
,Q3	001-021080	2N 3391
2	001-021320	D44C5(GE)
,D2,D3,D4	001-024050	1N 3189
,D6	001-023026	1N 4744
7	001-023027	1N 4750

S:

NLESS OTHERWISE NOTED:
ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 10%;
ALL CAPACITOR VALUES ARE IN MICROFARADS.

RANSISTORS Q1 AND Q2 HAVE THEIR COLLECTORS
OUNTED TO THE HEAT SINK AND GROUNDED.
RANSISTOR Q3 HAS ITS COLLECTOR MOUNTED TO
HE SAME HEAT SINK AND INSULATED.

REVISIONS

2100
VAC
0 HZ
240 VAC
50/60 HZ
FUSE
AC LINE SWITCH
PRI
BLK
BLK/RED
BRN
BLK/YEL
GRA
PILOT LIGHT
50851,TYP

POWER SUPPLY 124-000392

This power supply is used in the 1021 synthesizer to supply regulated volta +14 volt, -14 volt, and -28 volt. Th provides all the power requirements f ject synthesizer.

AC voltage from the secondary of a po former is rectified with full wave re produce both positive and negative vo

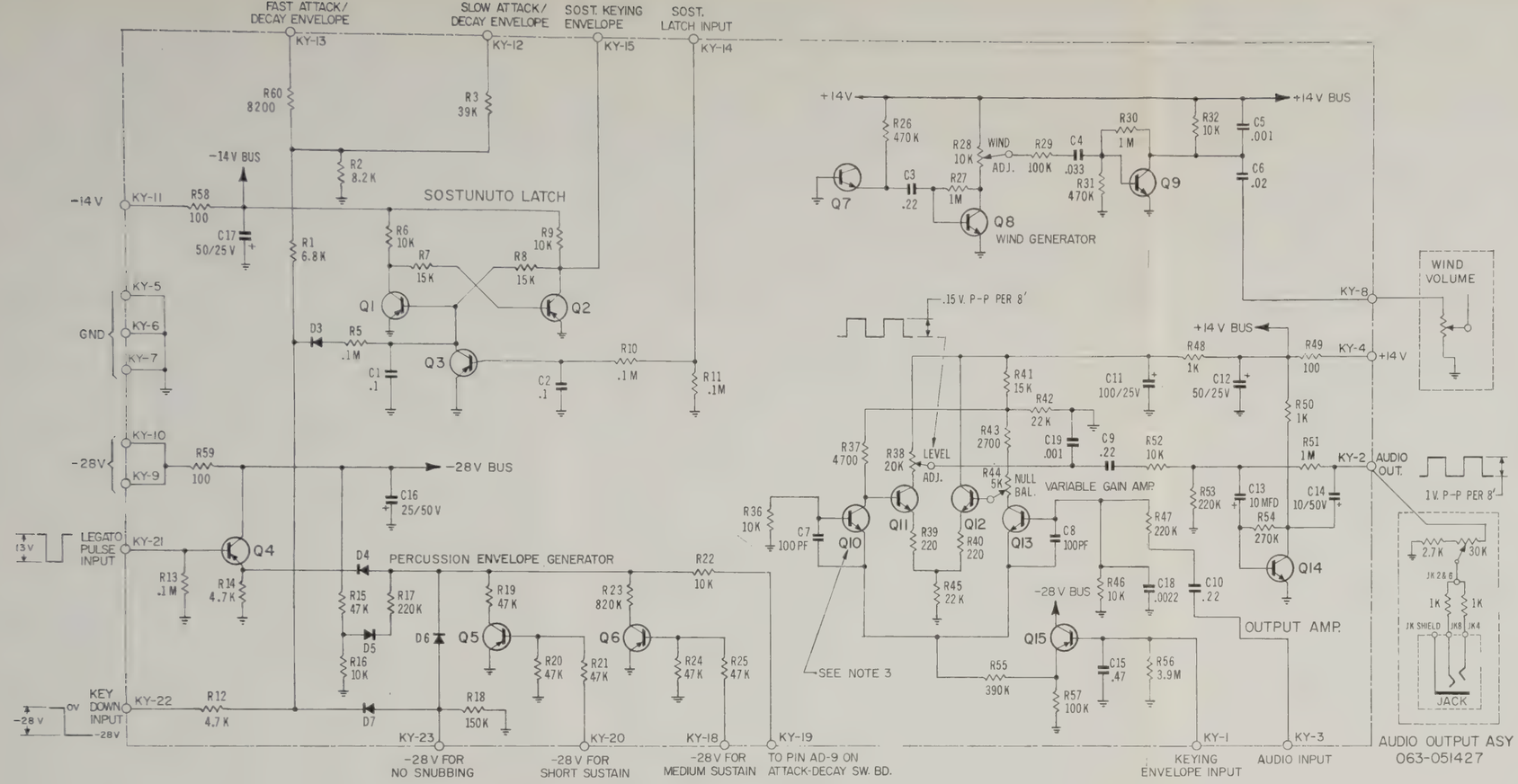
The positive voltage is filtered by C lated by shunt regulator Q1. R2, D5, vide the reference voltage for Q1. R short circuit protection for the +14

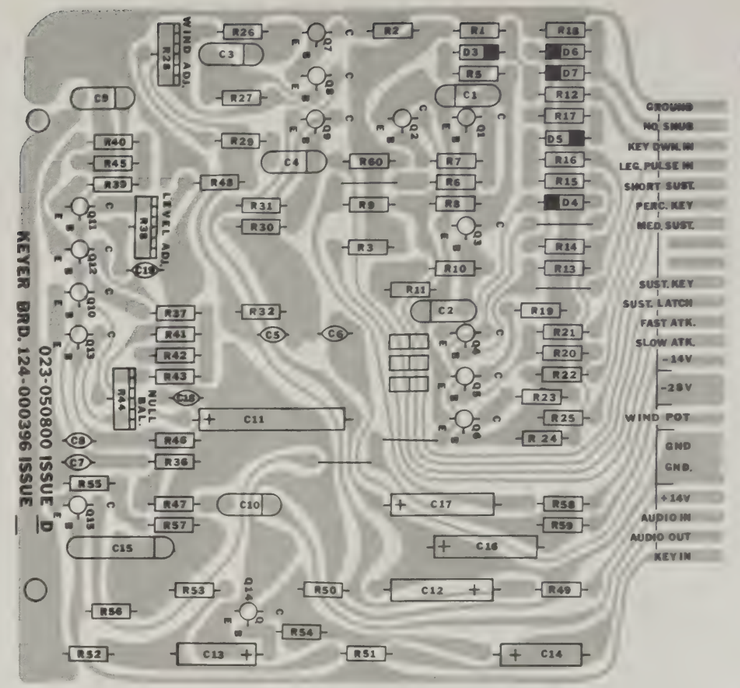
The negative rectified voltage is fil R5, and C5. For the -14 volt output negative voltage is regulated by shun Q2. R4, D6, and C3 provide the refer for Q2. R3 provides short circuit pr the -14 volt output.

8

FIGURE 3-12

POWER SUPPLY BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000392)





NOTES:

1. IF OTHERWISE NOT SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. SYMBOL KY-23 INDICATES EDGE CONNECTOR & IT'S TERMINAL NUMBER.
3. Q10 THRU Q13 (4 PCS) ARE TO BE MATCHED TRANSISTORS.

QTY	DESIGNATION SYMBOL	HAMMOND PART#	JEDEC PART #
7	Q1 THRU Q6 & Q15	001-021172	2N 4249
1	Q7	001-021210	2N 3565
3	Q8, Q9, Q14	001-021134	2N 3394
4	Q10, Q11, Q12, Q13 (MATCHED)	001-021260-001	2N 5826
7	D1 THRU D7	001-026080	IN 4148

KEYER BOARD 124-000396
094-050806-B

REVISIONS

KEYER 124-000396

The Keyer Board 124-000396 generates seven different DC keying envelopes that control the turn-on, turn-off rates of a variable gain differential amplifier. The differential stages are followed by a single transistor output amplifier stage.

The board also contains a three stage white noise generator to produce a wind noise.

Q7 functions as a break down diode to produce random (white) noise. The noise generator is amplified by Q8 and Q9. The output of Q9 is routed to the wind volume pot.

An audio input signal from terminal 3 is brought to the base of Q13. Q10 and Q13 comprise a variable gain differential amplifier which is normally off. A negative keying voltage on terminal 1 is buffered by emitter follower Q15. The negative voltage at the emitter of Q15 turns Q10 and Q13 on in proportion to the amplitude of the keying voltage. The outputs at the collectors of Q10 and Q13 are further amplified by a second differential pair comprised of Q11 and Q12. Examination of the dual differential pair amp will show that the AC signals at the bases of either Q10 or Q13 are summed at the output of Q11, while the common mode keying signal at the emitter of Q10 and Q13 is cancelled at the collector of Q11. A null balance potentiometer (R44) provides a means of balancing out any residual DC caused by mismatch of elements of the differential amplifiers. The output at the collector of Q11 is amplified by a conventional transistor stage comprised of Q14 and associated components.

Seven different keying envelopes may be generated and applied through external switching to the keying input, terminal 1.

1. Slow attack/decay (terminals 12 connected to terminal 1).
   A -28 volt key down signal at terminal 22 is accenuated by R12, R1 and R2 and transmitted through resistor R3 to charge capacitor C15. Upon release of the keying voltage, C1 discharges primarily through R2 and R3.

2. Fast attack/decay (terminal 13 connected to terminal 1).
   The action is similar to above except that R60 becomes the controlling resistor for charging C15, while the discharge of C15 is through R60 and R2.

3. Q1 and Q2 comprise a bistable latch. Prior to pressing the sostenuto switch -28 volt is present at terminal 14 holding Q3 on, Q1 off and Q2 on. Negative keying signals brought to the base of Q1 via diode D3 and R5 will be shorted to ground through Q3 and will not affect the state of latch transistors Q1 and Q2. When the sostenuto switch is pressed, the voltage is removed from terminal 14 and Q3 turns off. Thereafter, the first input from the key down line will turn Q1 on which, in turn, turns Q2 off and a negative voltage appears at the collector of Q2 to charge C15. In this mode the keyed tone sounds continuously (but changes in frequency with new notes played) until such time that another keying mode is selected. Upon selection of an alternate keying mode, voltage is reapplied to terminal 14 and latch transistor Q1 and Q2 revert to their initial states.

4. Percussion - Long Sustain - No Snubbing (terminal 19 connected to terminal 1)

   A negative pulse at terminal 21 is buffered by Q4 and charges capacitor C15 through resistor R22. C15 starts to discharge immediately, first primarily through R17 to a voltage level established by R15 and R16. When the charge on C15 becomes less negative than the voltage at the junction of R15 and R16, diode D5 blocks further discharge through R17 to a voltage level established by R15 and R16. When the charge on C15 becomes less negative than the voltage at the junction of R15 and R16, diode D5 blocks further discharge through R17 and the discharge continues at a slower rate through R56. Throughout the cycle, discharge through R18 is prevented by applying back bias to diode D6 via terminal 23.

5. Percussion - Long Sustain - With Snubbing (terminal 19 connected to terminal 1)

   The operation is similar to the above except no voltage is present at terminal 23. The back bias for D6 is derived from the key down input line through D7. Hence, when all keys are released, no biasing voltage is present at the anode of D6 and the remaining charge on C15, if any, dissipates rapidly through R18.

6. Percussion - Medium Sustain

   The operation is similar to paragraph 4 above except that Q6 is turned on by application of a negative voltage to terminal 18. R23 affords a second discharge path in parallel with R56 resulting in a shorter decay time.

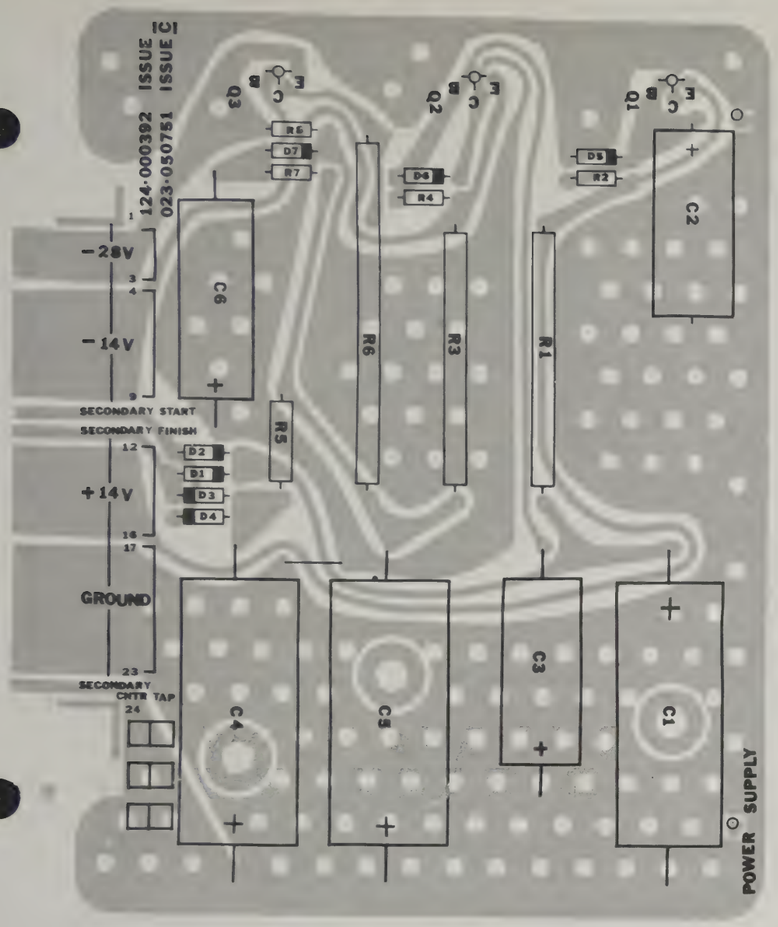
7. Percussion - Short Sustain

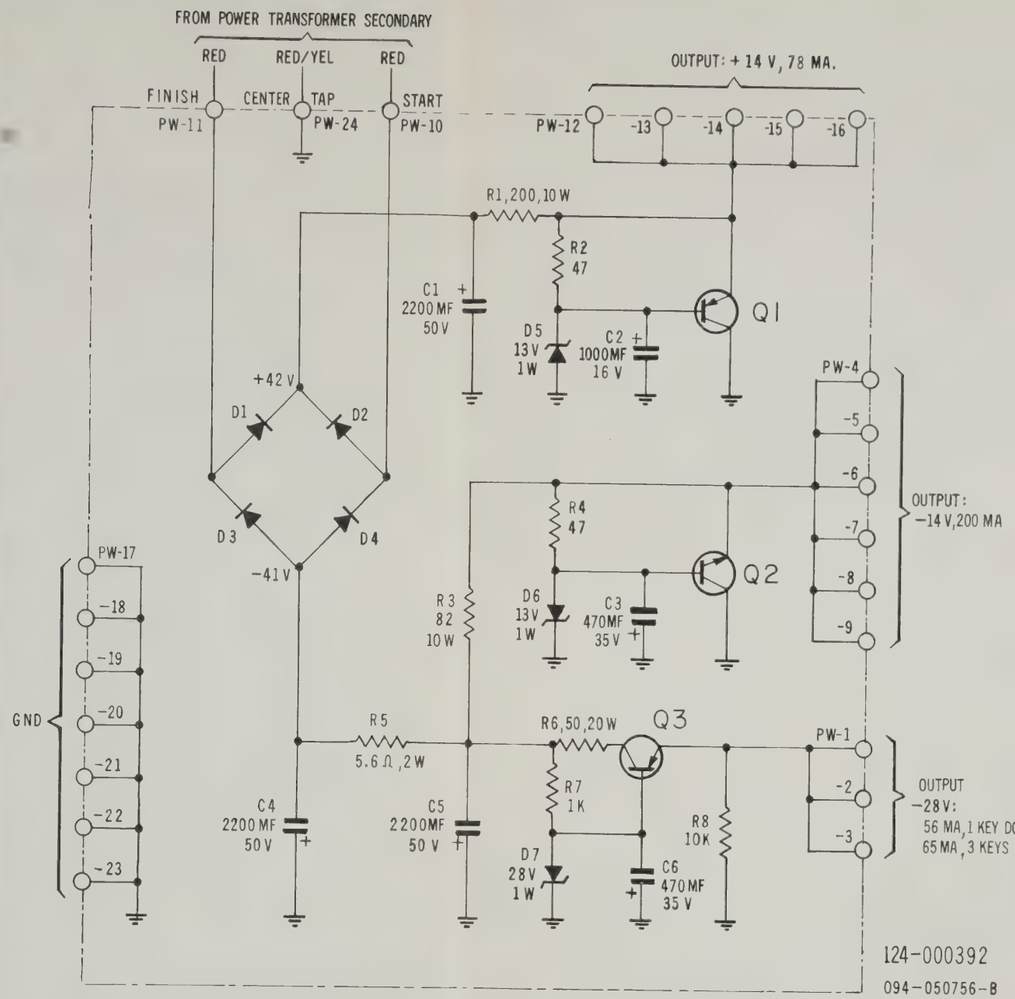
   Similar to paragraph 5 above except that voltage at terminal 20 turns on transistor Q5, placing R19 in parallel with R56. Q6 is left in an off condition.

7

FIGURE 3-11

KEYER BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000396)



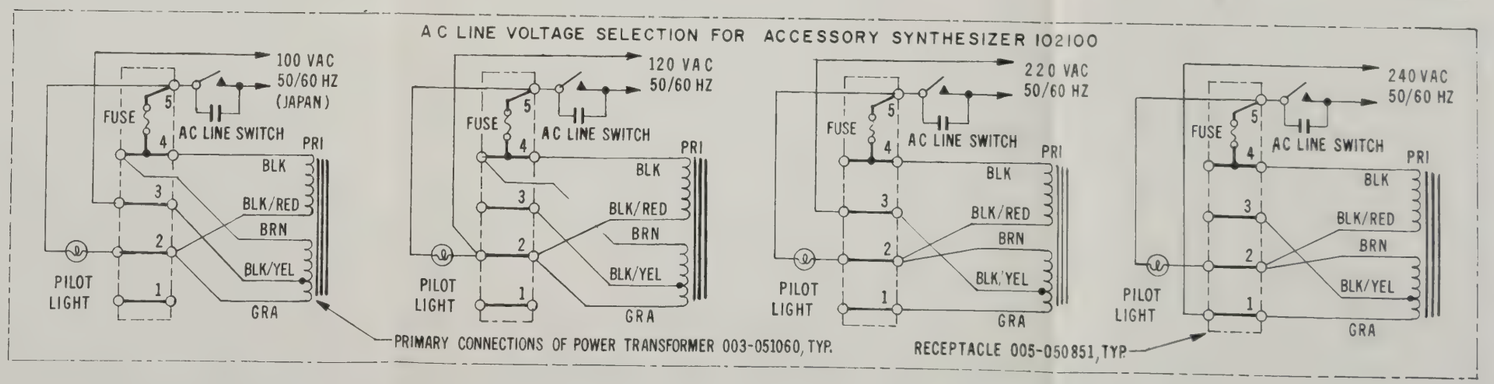


QTY	DESIGNATION SYMBOL	HAMMOND PART NO.	JEDEC PART NO.
2	Q1, Q3	001-021080	2N 3391
1	Q2	001-021320	D44C5 (GE)
4	D1, D2, D3, D4	001-024050	1N 3189
2	D5, D6	001-023026	1N 4744
1	D7	001-023027	1N 4750

NOTES:

1. UNLESS OTHERWISE NOTED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ± 10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. TRANSISTORS Q1 AND Q2 HAVE THEIR COLLECTORS MOUNTED TO THE HEAT SINK AND GROUNDED.
   TRANSISTOR Q3 HAS ITS COLLECTOR MOUNTED TO THE SAME HEAT SINK AND INSULATED.

REVISIONS



POWER SUPPLY 124-000392

This power supply is used in the 102100 series synthesizer to supply regulated voltages at +14 volt, -14 volt, and -28 volt. This supply provides all the power requirements for the subject synthesizer.

AC voltage from the secondary of a power transformer is rectified with full wave rectifiers to produce both positive and negative voltages.

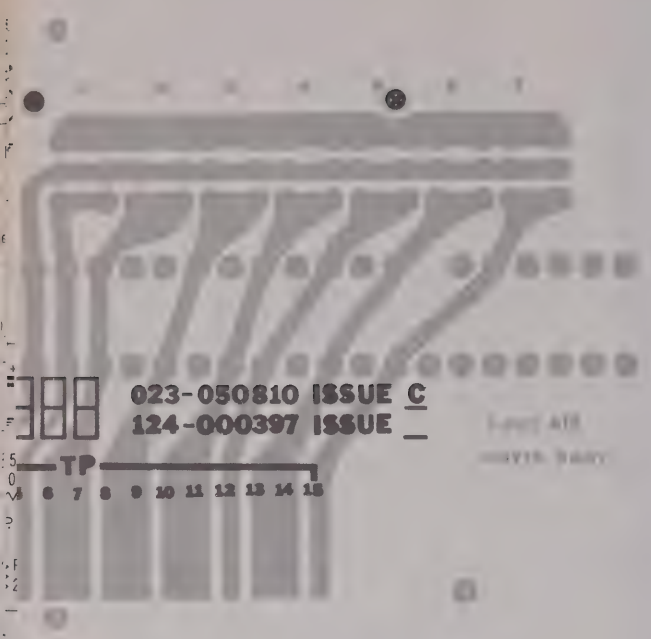
The positive voltage is filtered by C1 and regulated by shunt regulator Q1. R2, D5, and C2 provide the reference voltage for Q1. R1 provides short circuit protection for the +14 volt output.

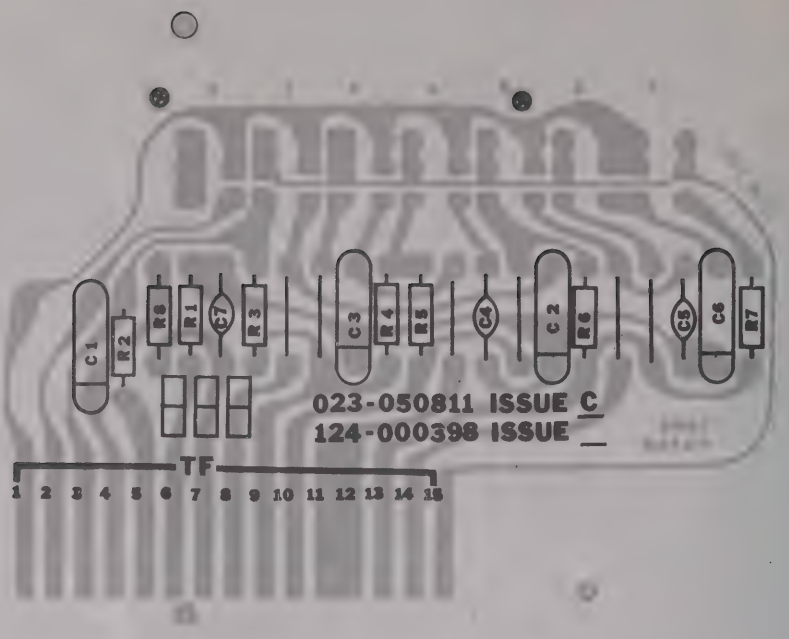
The negative rectified voltage is filtered by C4, R5, and C5. For the -14 volt output the filtered negative voltage is regulated by shunt regulator Q2. R4, D6, and C3 provide the reference voltage for Q2. R3 provides short circuit protection for the -14 volt output.

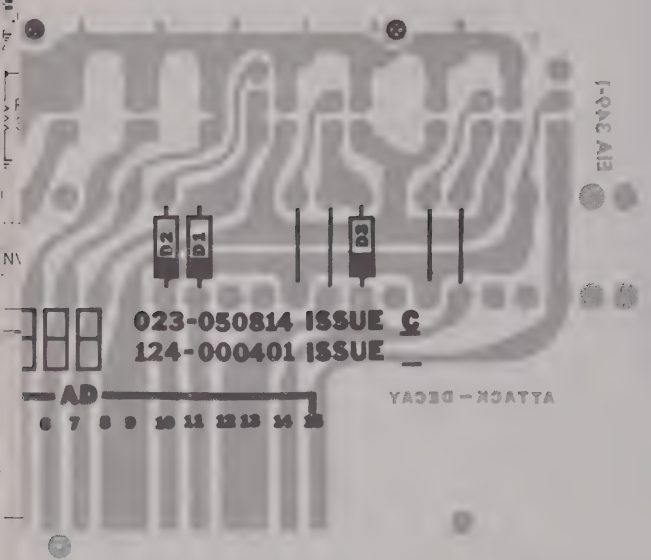
For the -28 volt supply the filtered negative voltage is applied to series regulator Q3. R7, D7, and C6 provide the reference voltage for Q3. R6 provides short circuit protection for Q3 and for the -28 volt output.

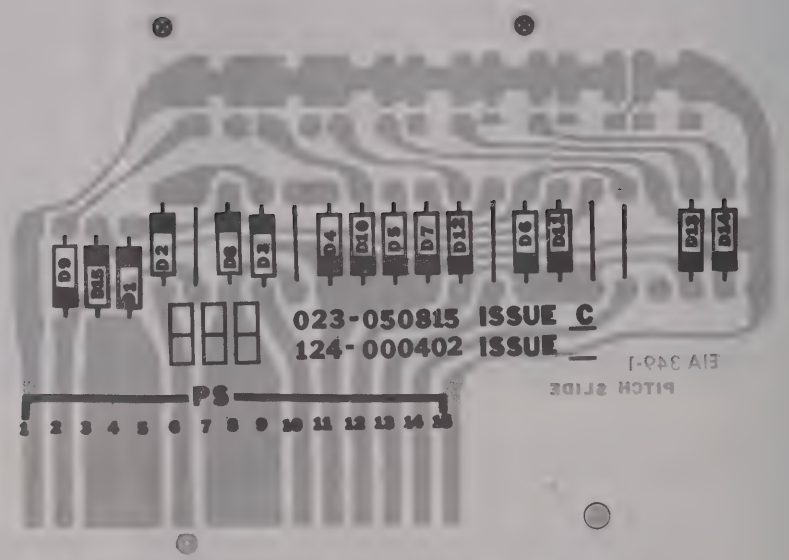
FIGURE 3-12

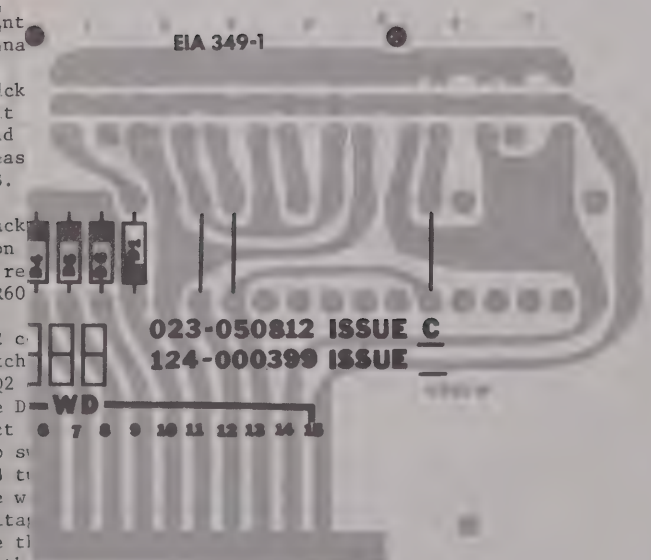
POWER SUPPLY BOARD - SCHEMATIC, LAYOUT AND THEORY (124-000392)

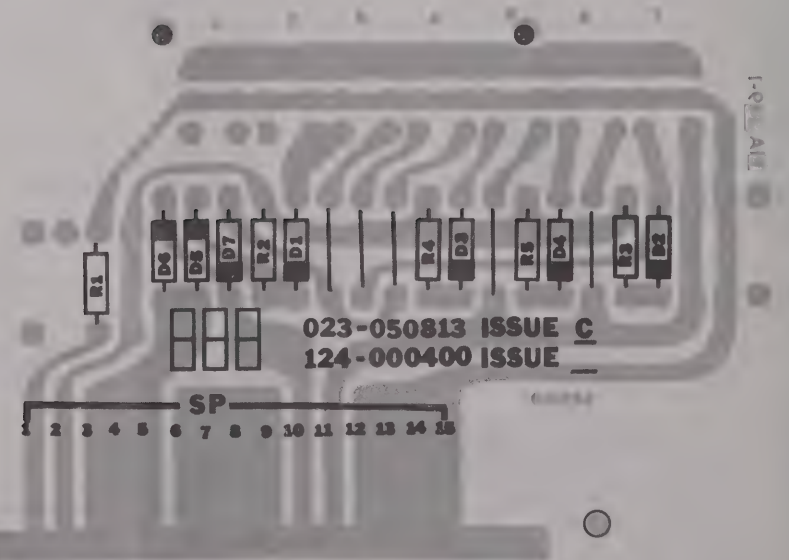

023-050810 ISSUE C
124-000397 ISSUE _
TP
6 7 8 9 10 11 12 13 14 15

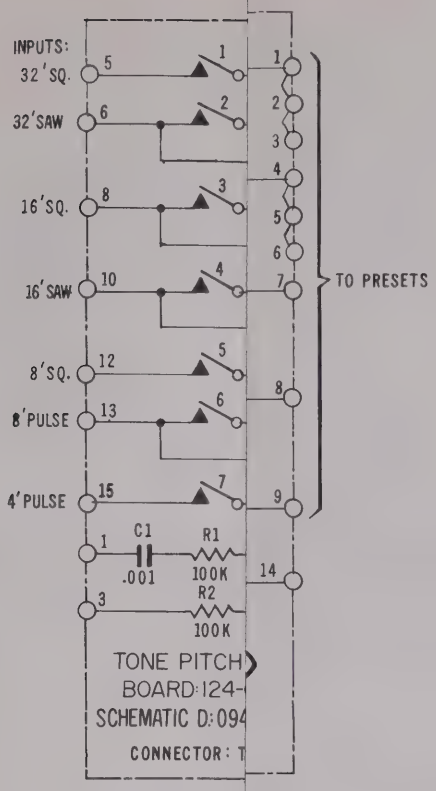

C1
R2
R8
R1
C7
R3
C3
R4
R5
C4
C2
R6
C8
C6
R7
023-050811 ISSUE C
124-000398 ISSUE _
TF
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

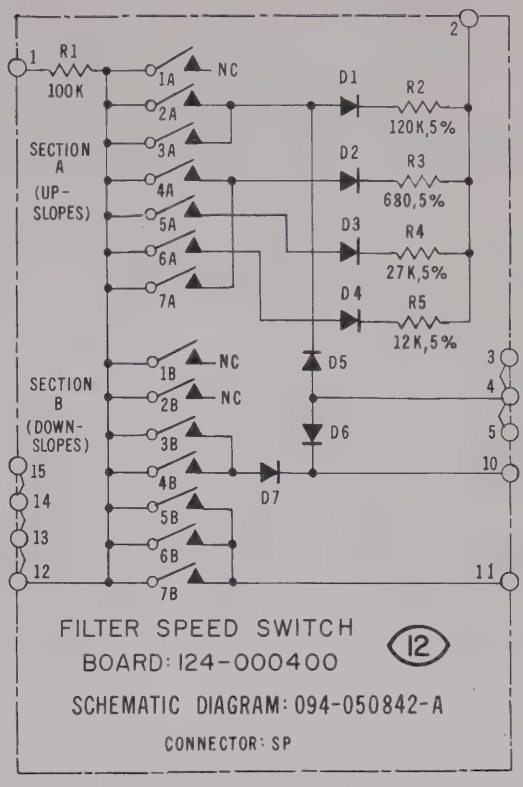

D2
D1
D3
023-050814 ISSUE C
124-000401 ISSUE _
AD
6 7 8 9 10 11 12 13 14 15

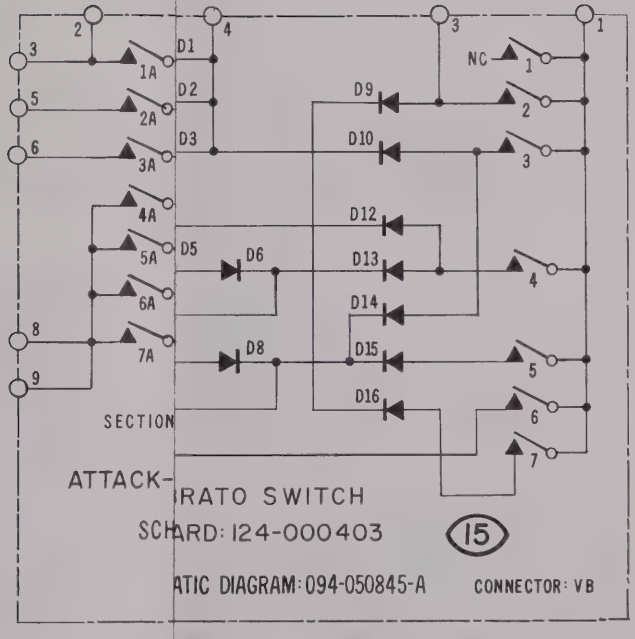

D9
D15
S1
D2
D8
D3
D4
D10
D5
D7
D12
D6
D11
D13
D14
023-050815 ISSUE C
124-000402 ISSUE _
PS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15


EIA 349-1
D4
D3
D2
D1
023-050812 ISSUE C
124-000399 ISSUE _
WD
6 7 8 9 10 11 12 13 14 15


R1
D6
D5
D7
R2
D1
R4
D3
R5
D4
R3
D2
023-050813 ISSUE C
124-000400 ISSUE _
SP
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



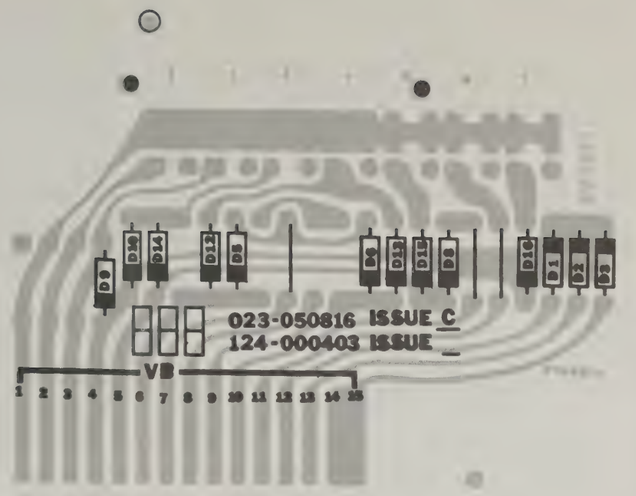


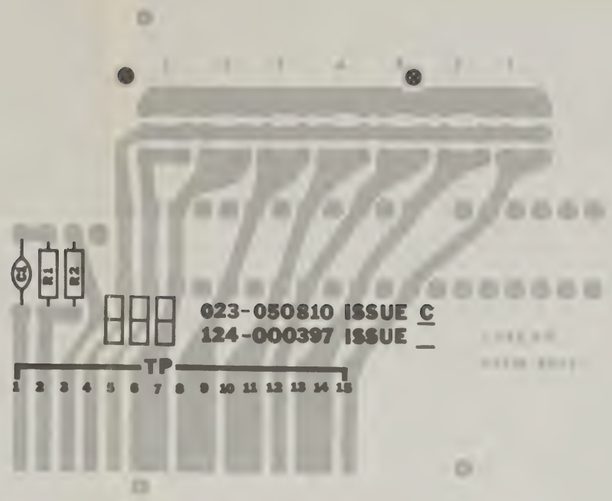


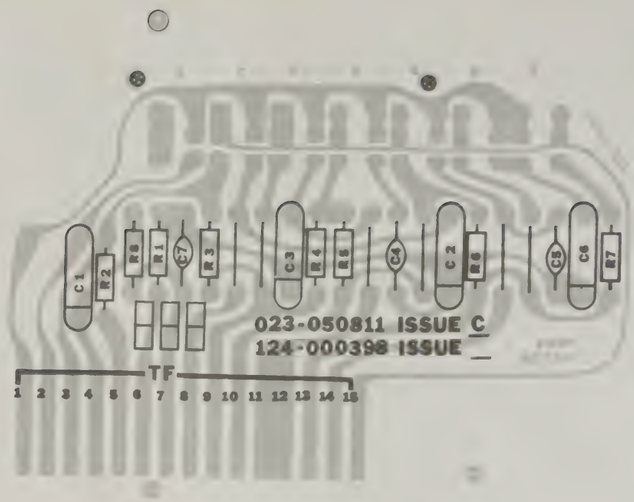
NOTES:

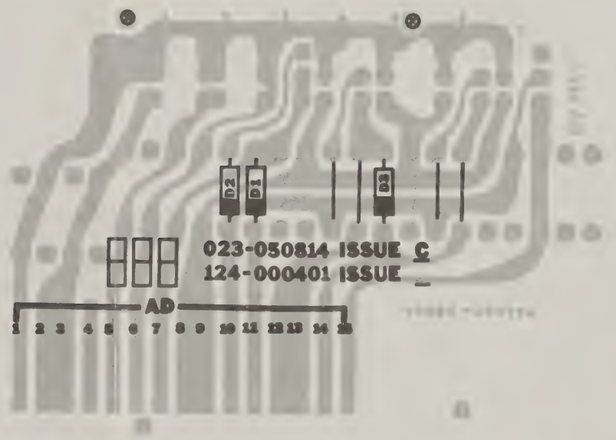
1. UNLESS OTH
ALL RESIST
ALL CAPAC
2. ALL SWITCH
3. SYMBOL

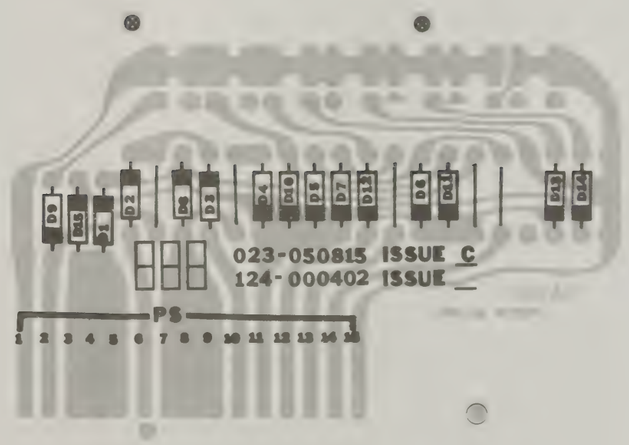
REVISIONS		

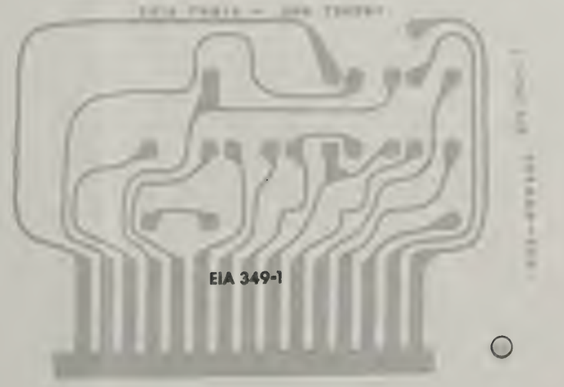


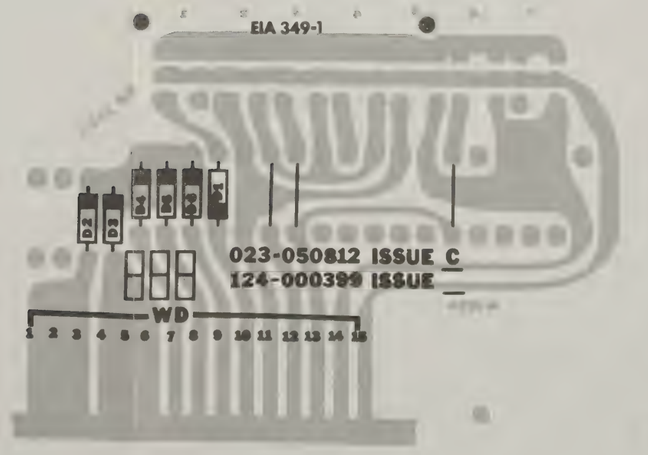












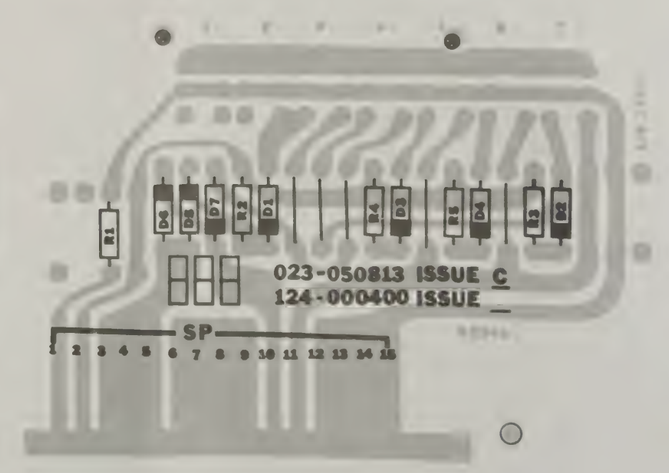
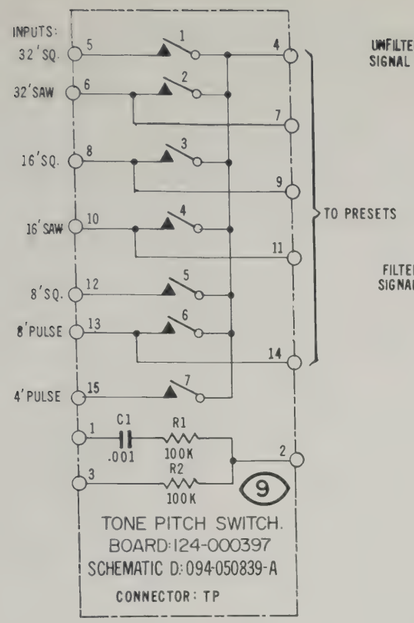


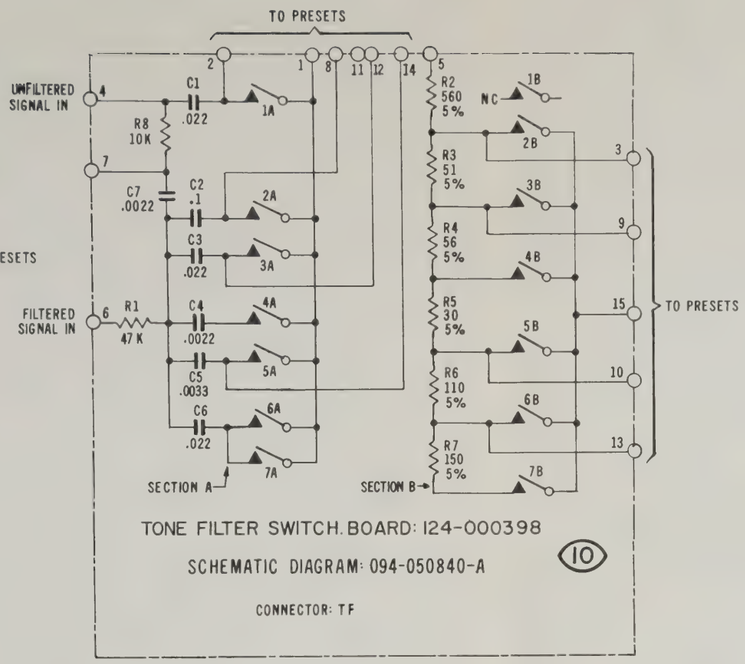
FIGURE 3-13

PRESET AND SWITCH BOARD LAYOUTS
(124-000397 THRU 124-000404)



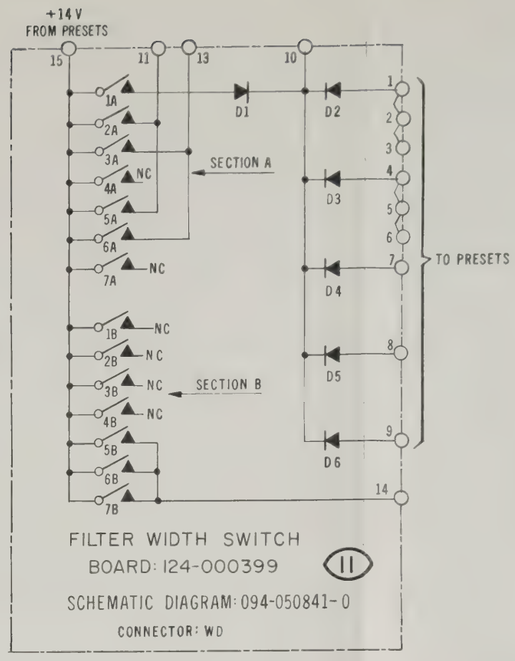
9

TONE PITCH SWITCH.
BOARD: 124-000397
SCHEMATIC D: 094-050839-A
CONNECTOR: TP



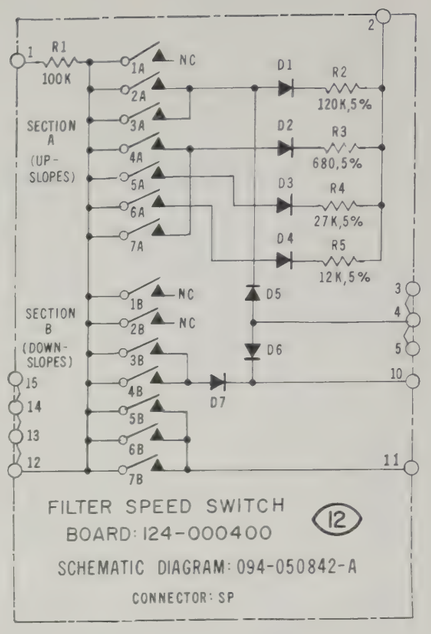
10

TONE FILTER SWITCH. BOARD: 124-000398
SCHEMATIC DIAGRAM: 094-050840-A
CONNECTOR: TF



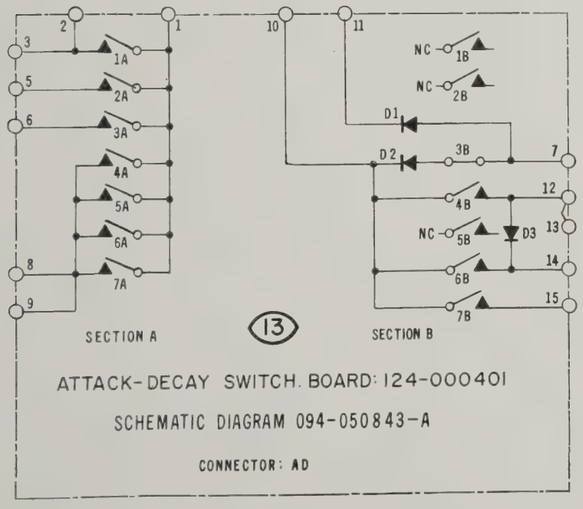
11

FILTER WIDTH SWITCH
BOARD: 124-000399
SCHEMATIC DIAGRAM: 094-050841-0
CONNECTOR: WD



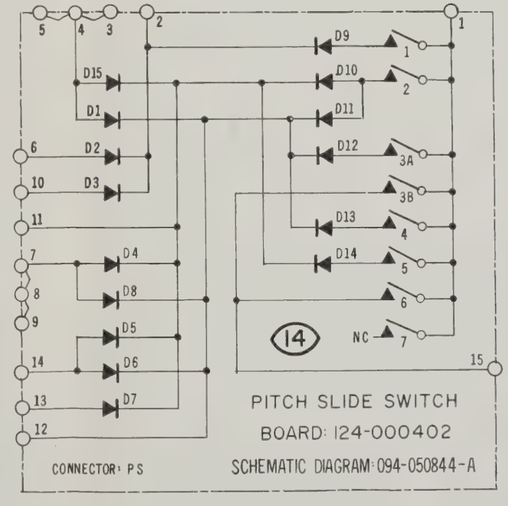
12

FILTER SPEED SWITCH
BOARD: 124-000400
SCHEMATIC DIAGRAM: 094-050842-A
CONNECTOR: SP



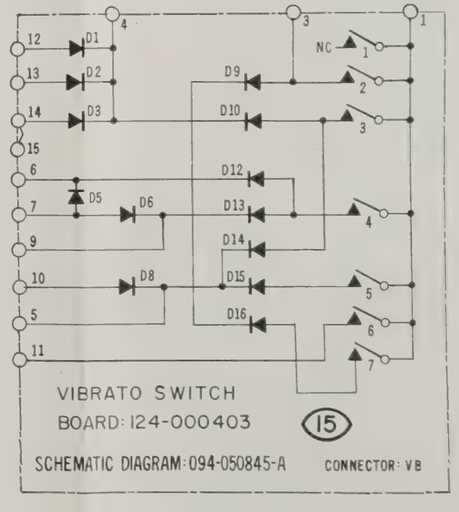
13

ATTACK-DECAY SWITCH. BOARD: 124-000401
SCHEMATIC DIAGRAM 094-050843-A
CONNECTOR: AD



14

PITCH SLIDE SWITCH
BOARD: 124-000402
SCHEMATIC DIAGRAM: 094-050844-A
CONNECTOR: PS



15

VIBRATO SWITCH
BOARD: 124-000403
SCHEMATIC DIAGRAM: 094-050845-A
CONNECTOR: VB

NOTES:

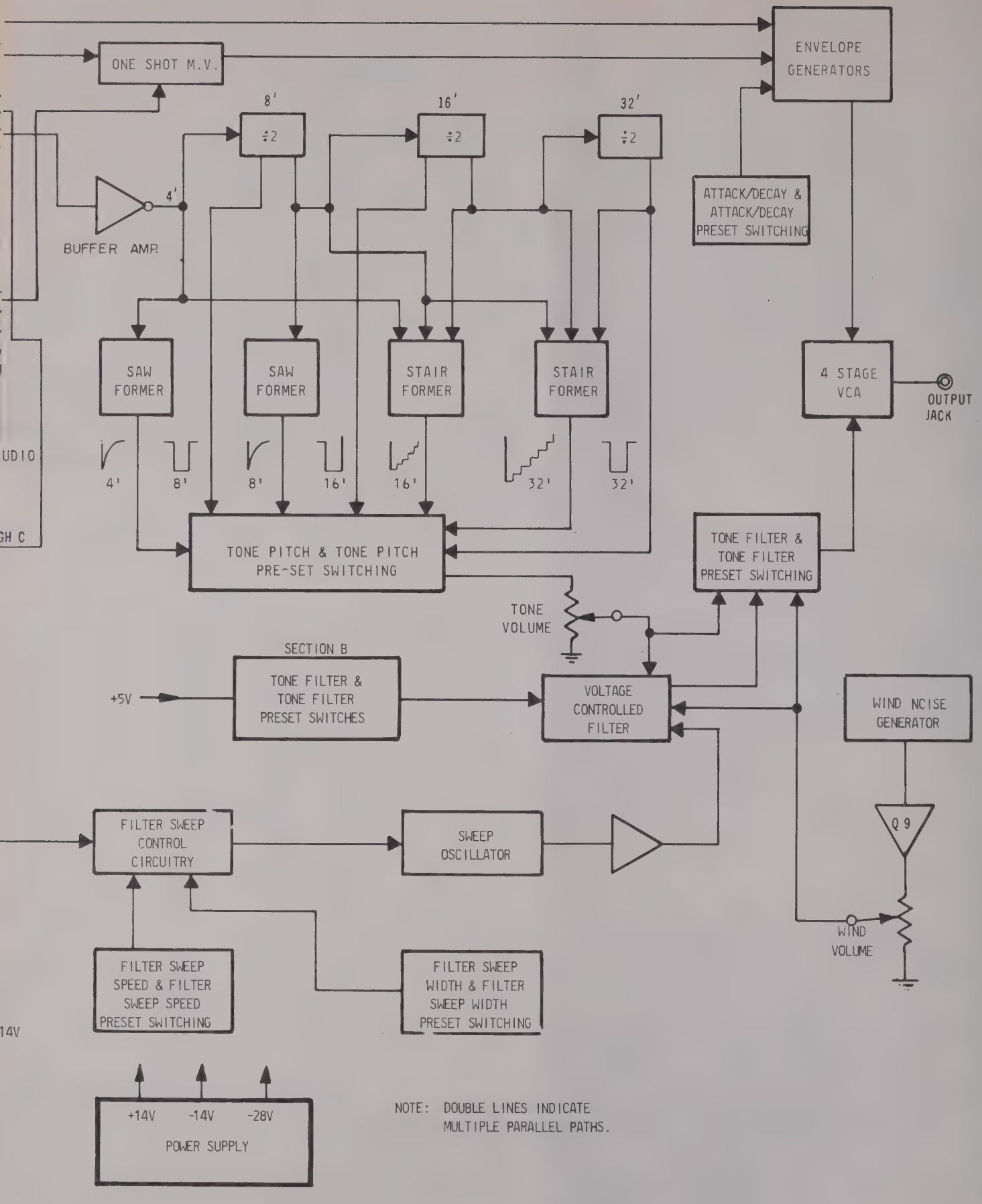
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT, ±10%;
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL SWITCHES SHOWN ARE IN "OFF" POSITION.
3. SYMBOL ○3 INDICATES P.W.BOARD EDGE CONNECTOR PIN & IT'S NUMBER.

DESIGNATION SYMBOL	HAMMOND PART #	JEDEC PART #
ALL DIODES, ALL BOARDS (D1-D16)	001-026080	1N 4148

FIGURE 3-14

SWITCH BOARD SCHEMATICS
(124-000397 THRU
124-000403)

REVISIONS


ONE SHOT M.V.
ENVELOPE GENERATORS
8'
16'
32'
÷2
÷2
÷2
4'
BUFFER AMP.
ATTACK/DECAY & ATTACK/DECAY PRESET SWITCHING
SAW FORMER
SAW FORMER
STAIR FORMER
STAIR FORMER
4 STAGE VCA
OUTPUT JACK
4'
8'
8'
16'
16'
32'
32'
TONE PITCH & TONE PITCH PRE-SET SWITCHING
TONE FILTER & TONE FILTER PRESET SWITCHING
TONE VOLUME
SECTION B
+5V
TONE FILTER & TONE FILTER PRESET SWITCHES
VOLTAGE CONTROLLED FILTER
WIND NOISE GENERATOR
Q 9
FILTER SWEEP CONTROL CIRCUITRY
SWEEP OSCILLATOR
WIND VOLUME
FILTER SWEEP SPEED & FILTER SWEEP SPEED PRESET SWITCHING
FILTER SWEEP WIDTH & FILTER SWEEP WIDTH PRESET SWITCHING
+14V
-14V
-28V
POWER SUPPLY
NOTE: DOUBLE LINES INDICATE MULTIPLE PARALLEL PATHS.

SECTION IV
PARTS LIST

SYNTHESIZER 102100
ACCESSORY MODEL
INDEX

	PAGE
SYNTHESIZER - COMPLETE FRONT VIEW	4-2
Music Panel	
Music Rack	
Left & Right End Panels	
Housing (Top & Back Cover)	
Button & Preset End Block Assy.	
Manual Assembly	
Front Strip	
A.C. Line Cord	
Stand Assembly	
SYNTHESIZER - BOTTOM VIEW	4-2
End Block Assemblies	
End Panels	
Front Strip	
Foot (For Base)	
Hardware	
FRONT EXPOSED VIEW	4-3
Slide Potentiometer Assembly	
Selector & Preset Knobs	
Note Generator Board (124-000391)	
Legato Pulse Board (124-000395)	
Keyer Board (124-000396)	
Power Supply Board (124-000392)	
Line Switch	
Hinge (Plain Butt)	
End Panels & Bracket	
Logo & Bezel	
FRONT VIEW (MANUAL IN THE SWING-UP POSITION)	4-3
Tone Pitch Board (124-000397)	
Tone Filter Board (124-000398)	
Width Board (124-000399)	
Speed Board (124-000400)	
Attack/Decay Board (124-000401)	
Pitch Slide Board (124-000402)	

	PAGE
FRONT VIEW (MANUAL IN THE SWING-UP POSITION CONTINUED)	4-3
Vibrato Board (124-000403)	
Preset Board (124-000404)	
Manual Boards 1 & 2	
Hi-Select Board (124-000389)	
Plug Connectors	
REAR EXPOSED VIEW	4-4
Power Transformer	
Fuse, Holder & Cover	
Power Supply Board (124-000392)	
Filter Board (124-000394)	
Keyer Board (124-000396)	
Pitch Modulator Board (124-000393)	
Legato Pulse Board (124-000395)	
Note Generator Board (124-000391)	
Octave Generator Board (124-000390)	
Audio Output Assembly	
Grommets	
Connectors & Terminal Pins	
PRINTED WIRING BOARDS PARTS LIST	4-4 THRU 4-5
Hi-Select Board (124-000389)	
Octave Generator Board (124-000390)	
Note Generator Board (124-000391)	
Power Supply Board (124-000392)	
Pitch Modulator Board (124-000393)	
Filter Board (124-000394)	
Legato Pulse Board (124-000395)	
Keyer Board (124-000396)	
Tone Pitch Board (124-000397)	
Tone Filter Board (124-000398)	
Width Board (124-000399)	
Speed Board (124-000400)	
Attack/Decay Board (124-000401)	
Pitch Slide Board (124-000402)	
Vibrato Board (124-000403)	
KEY AND SPRING ASSEMBLY	4-6
Key and Spring Modules	
Switch Actuator	
Clamp Strips	

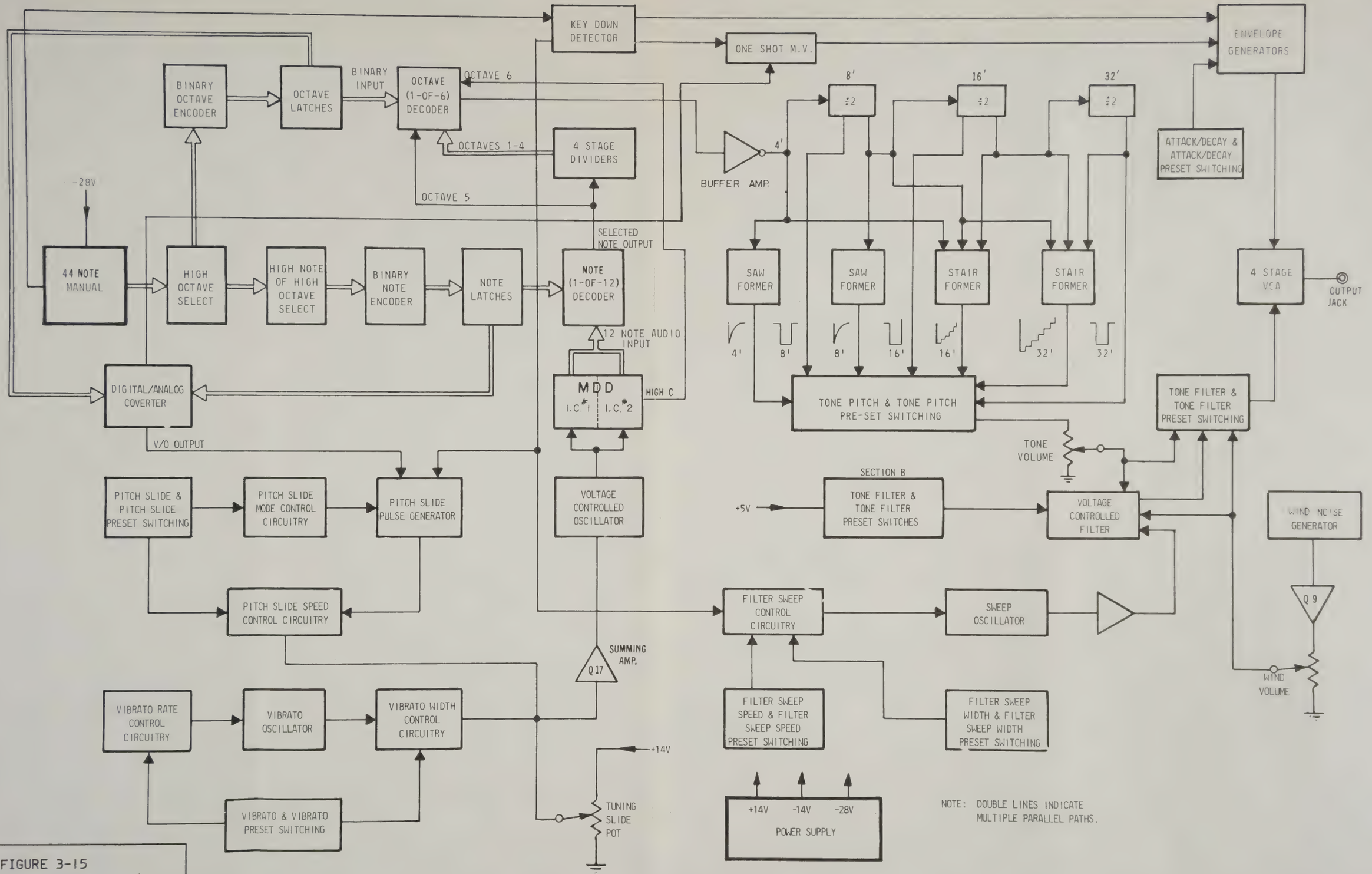


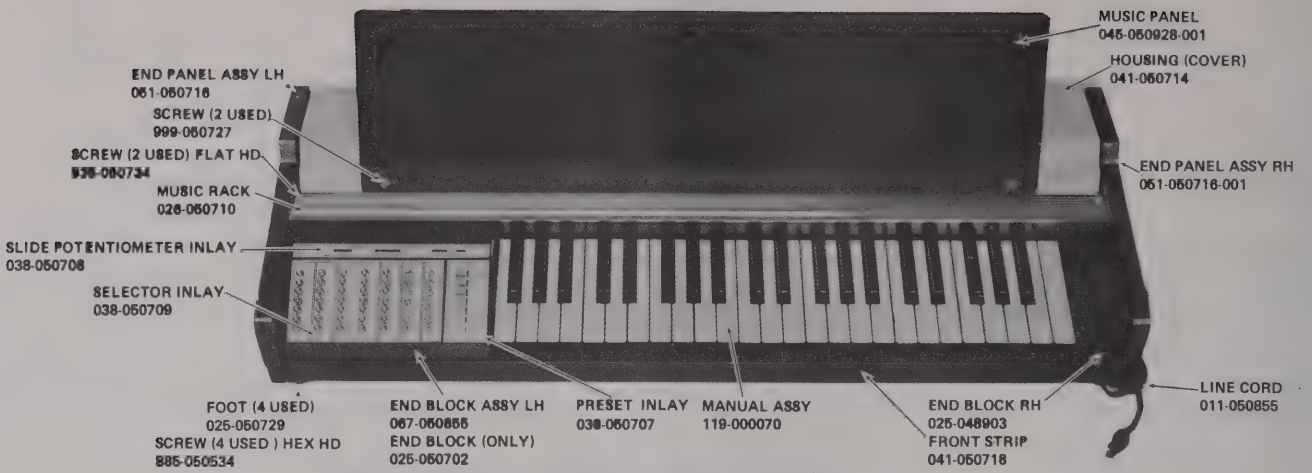
FIGURE 3-15

SYNTHESIZER FLOW BLOCK DIAGRAM

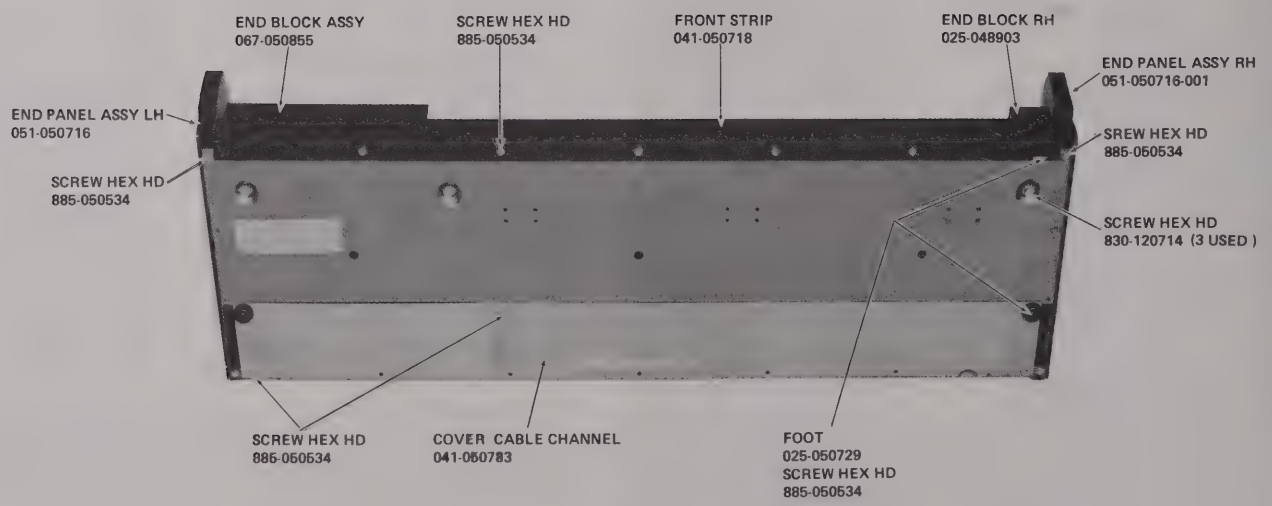
SECTION IV
PARTS LIST

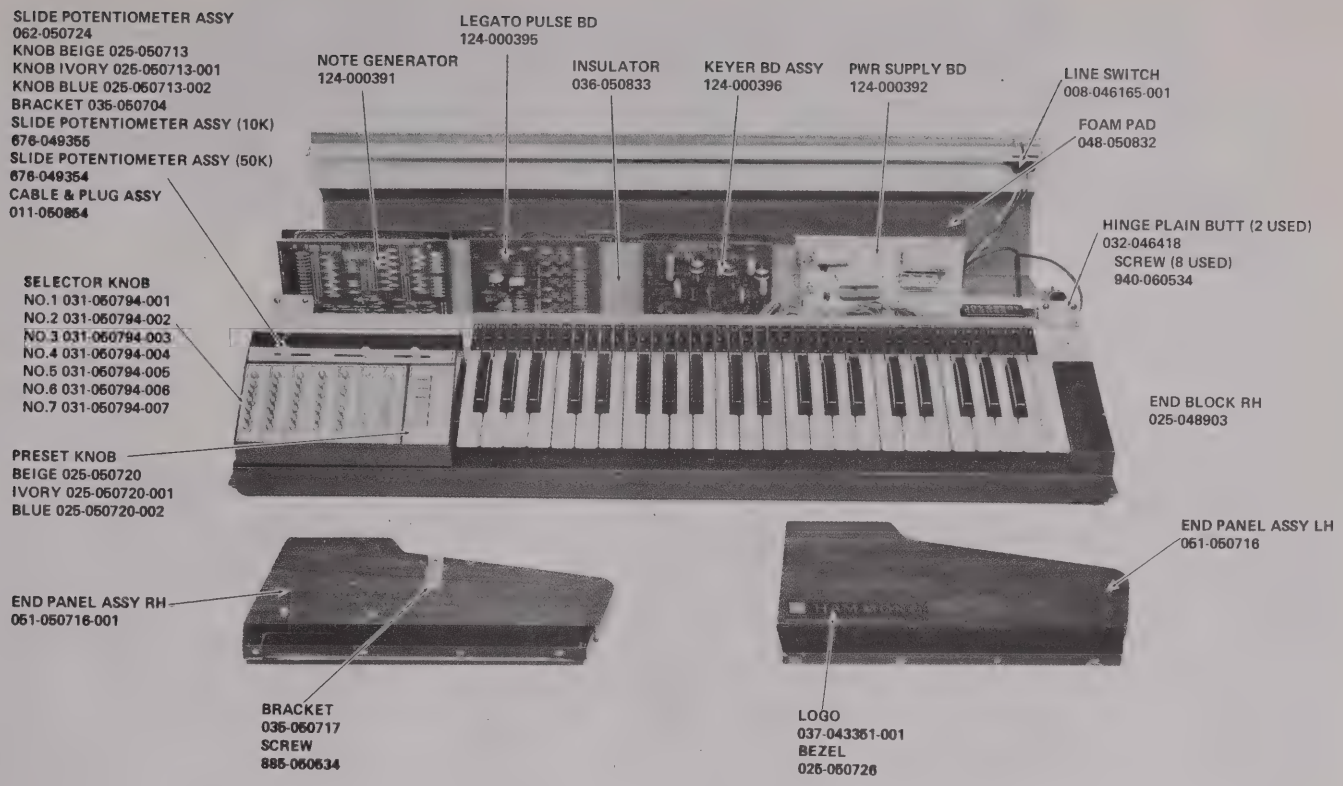
SYNTHESIZER 102100
ACCESSORY MODEL
INDEX

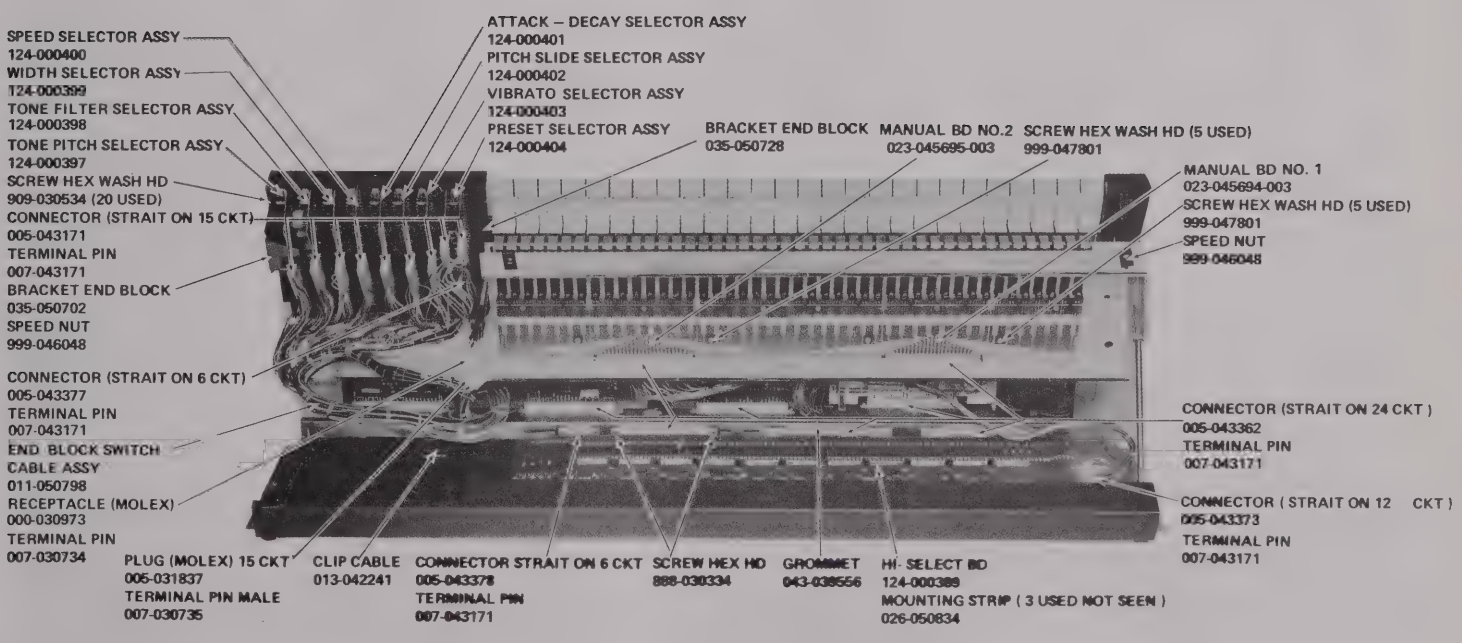
	PAGE
SYNTHESIZER - COMPLETE FRONT VIEW	4-2
Music Panel	
Music Rack	
Left & Right End Panels	
Housing (Top & Back Cover)	
Button & Preset End Block Assy.	
Manual Assembly	
Front Strip	
A.C. Line Cord	
Stand Assembly	
SYNTHESIZER - BOTTOM VIEW	4-2
End Block Assemblies	
End Panels	
Front Strip	
Foot (For Base)	
Hardware	
FRONT EXPOSED VIEW	4-3
Slide Potentiometer Assembly	
Selector & Preset Knobs	
Note Generator Board (124-000391)	
Legato Pulse Board (124-000395)	
Keyer Board (124-000396)	
Power Supply Board (124-000392)	
Line Switch	
Hinge (Plain Butt)	
End Panels & Bracket	
Logo & Bezel	
FRONT VIEW (MANUAL IN THE SWING-UP POSITION)	4-3
Tone Pitch Board (124-000397)	
Tone Filter Board (124-000398)	
Width Board (124-000399)	
Speed Board (124-000400)	
Attack/Decay Board (124-000401)	
Pitch Slide Board (124-000402)	
FRONT VIEW (MANUAL IN THE SWING-UP POSITION CONTINUED)	4-3
Vibrato Board (124-000403)	
Preset Board (124-000404)	
Manual Boards 1 & 2	
Hi-Select Board (124-000389)	
Plug Connectors	
REAR EXPOSED VIEW	4-4
Power Transformer	
Fuse, Holder & Cover	
Power Supply Board (124-000392)	
Filter Board (124-000394)	
Keyer Board (124-000396)	
Pitch Modulator Board (124-000393)	
Legato Pulse Board (124-000395)	
Note Generator Board (124-000391)	
Octave Generator Board (124-000390)	
Audio Output Assembly	
Grommets	
Connectors & Terminal Pins	
PRINTED WIRING BOARDS PARTS LIST	4-4 THRU 4-5
Hi-Select Board (124-000389)	
Octave Generator Board (124-000390)	
Note Generator Board (124-000391)	
Power Supply Board (124-000392)	
Pitch Modulator Board (124-000393)	
Filter Board (124-000394)	
Legato Pulse Board (124-000395)	
Keyer Board (124-000396)	
Tone Pitch Board (124-000397)	
Tone Filter Board (124-000398)	
Width Board (124-000399)	
Speed Board (124-000400)	
Attack/Decay Board (124-000401)	
Pitch Slide Board (124-000402)	
Vibrato Board (124-000403)	
KEY AND SPRING ASSEMBLY	4-6
Key and Spring Modules	
Switch Actuator	
Clamp Strips	

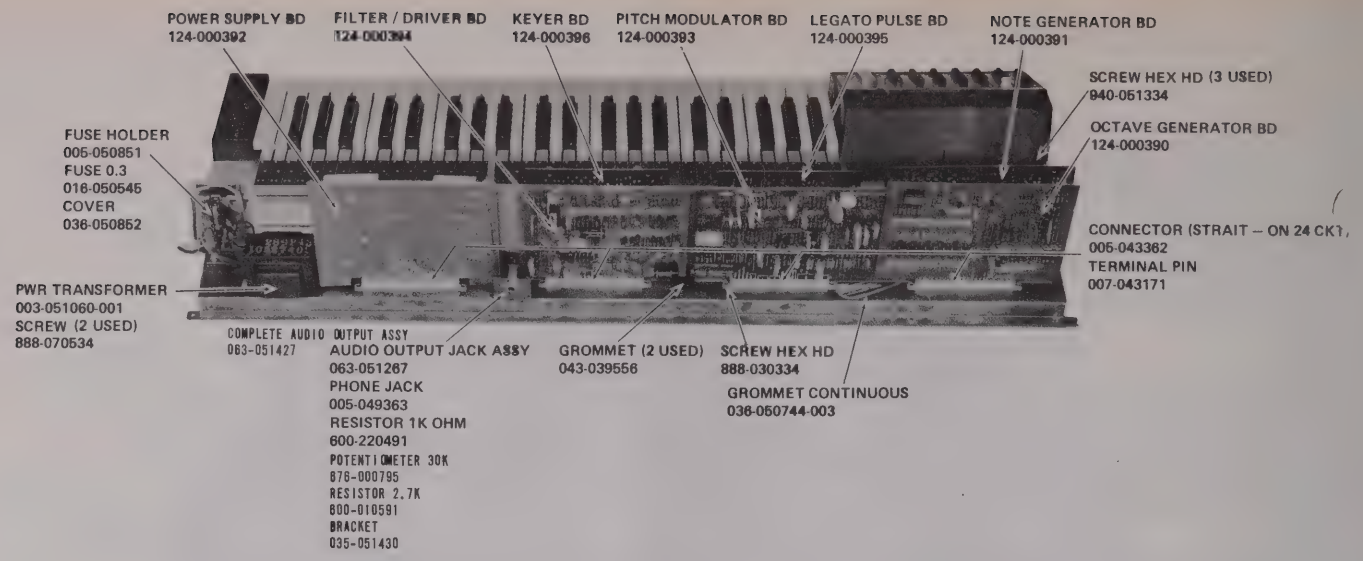


SYNTHESIZER 102100




SLIDE POTENTIOMETER ASSY
062-050724
KNOB BEIGE 025-050713
KNOB IVORY 025-050713-001
KNOB BLUE 025-050713-002
BRACKET 035-050704
SLIDE POTENTIOMETER ASSY (10K)
676-049355
SLIDE POTENTIOMETER ASSY (50K)
676-049354
CABLE & PLUG ASSY
011-050854
LEGATO PULSE BD
124-000395
NOTE GENERATOR
124-000391
INSULATOR
036-050833
KEYER BD ASSY
124-000396
PWR SUPPLY BD
124-000392
LINE SWITCH
008-046165-001
FOAM PAD
048-050832
HINGE PLAIN BUTT (2 USED)
032-046418
SCREW (8 USED)
940-060534
SELECTOR KNOB
NO.1 031-050794-001
NO.2 031-050794-002
NO.3 031-050794-003
NO.4 031-050794-004
NO.5 031-050794-005
NO.6 031-050794-006
NO.7 031-050794-007
END BLOCK RH
025-048903
PRESET KNOB
BEIGE 025-050720
IVORY 025-050720-001
BLUE 025-050720-002
END PANEL ASSY LH
051-050716
END PANEL ASSY RH
051-050716-001
BRACKET
035-050717
SCREW
885-050534
LOGO
037-043361-001
BEZEL
025-050726


SPEED SELECTOR ASSY
124-000400
WIDTH SELECTOR ASSY
124-000399
TONE FILTER SELECTOR ASSY
124-000398
TONE PITCH SELECTOR ASSY
124-000397
SCREW HEX WASH HD
909-030534 (20 USED)
CONNECTOR (STRAIT ON 15 CKT)
005-043171
TERMINAL PIN
007-043171
BRACKET END BLOCK
035-050702
SPEED NUT
999-046048
CONNECTOR (STRAIT ON 6 CKT)
005-043377
TERMINAL PIN
007-043171
END BLOCK SWITCH CABLE ASSY
011-050798
RECEPTACLE (MOLEX)
000-030973
TERMINAL PIN
007-030734
ATTACK – DECAY SELECTOR ASSY
124-000401
PITCH SLIDE SELECTOR ASSY
124-000402
VIBRATO SELECTOR ASSY
124-000403
PRESET SELECTOR ASSY
124-000404
BRACKET END BLOCK
035-050728
MANUAL BD NO.2
023-045695-003
SCREW HEX WASH HD (5 USED)
999-047801
MANUAL BD NO. 1
023-045694-003
SCREW HEX WASH HD (5 USED)
999-047801
SPEED NUT
999-046048
CONNECTOR (STRAIT ON 24 CKT)
005-043362
TERMINAL PIN
007-043171
CONNECTOR (STRAIT ON 12 CKT)
005-043373
TERMINAL PIN
007-043171
PLUG (MOLEX) 15 CKT
005-031837
TERMINAL PIN MALE
007-030735
CLIP CABLE
013-042241
CONNECTOR STRAIT ON 6 CKT
005-043378
TERMINAL PIN
007-043171
SCREW HEX HD
888-030334
GROMMET
043-038556
HI- SELECT BD
124-000389
MOUNTING STRIP (3 USED NOT SEEN)
026-050834



124-000389 HIGH SELECT BOARD

PWB (No Parts)		023-050731
TRANSISTORS		
Q1-Q16		001-021172
DIODES		
Signal	D1-D261	001-226080
RESISTORS (Ohms)		
10K		600-220731
12K		600-220751
100K		600-220971
1.0M		600-221211
Busbar		041-050703-003

124-000390 OCTAVE GENERATOR BOARD

PWB (No Parts)		023-050738
TRANSISTORS		
Q1 Q21		001-021172
DIODES		
Signal	D1-D42	001-226080
*INTEGRATED CIRCUIT		
IC-1		075-000200
RESISTORS (Ohms)		
100		600-220251
1K		600-220491
4.7K		600-220651
10K		600-220731
22K		600-220811
27K		600-220831
39K		600-220871
47K		600-220891
100K		600-220971
220K		600-221051
330K		600-221091
680K		600-221171
CAPACITORS		
Mylar		
.22 MFD		412-110532
Ceramic		
.001 MFD		426-010503
.02 MFD		426-010763
.01 MFD		426-010743
Electrolytic		
10 MFD 50V		431-106509
Bus Bar		041-050703-005
*INTEGRATED CIRCUIT		
IC-1 EARLY UNITS		075-047298-001

124-000391 NOTE GENERATOR BOARD

PWB (No Parts)		023-050745
TRANSISTOR		
Q1-Q9		001-021172
Q10,Q11		001-021310
DIODE		
Varicap	D1	001-026310
Zener 10V,1W	D2	001-223039
Signal	D3-D62	001-226080
INTEGRATED CIRCUIT		
MDD242		075-047242
MDD243		075-047243
RESISTORS (Ohms)		
47		600-220171
100		600-220251
390		600-220391
470		600-220411
2.2K		600-220571
10K		600-220731
47K		600-220891
100K		600-220971
220K		600-221051
CAPACITOR		
Ceramic		
.05MFD,100V		427-170095
Electrolytic		
10MFD,50V		431-106509
22MFD, 25V		431-506259
47MFD,50V		431-506509
Bus Bar	B1	041-050703-001
Bus Bar	B2-B4	041-050703-002
Bus Bar	B5,B6	041-050703-003
Bus Bar	B7	041-050703-004
Bus Bar	B8-B10	041-050703-005

124-000392 POWER SUPPLY ASSEMBLY

PWB (No Parts)		023-050751
TRANSISTORS		
Q1, Q3		001-022080
Q2		001-021320
DIODE		
Rectifier	D1-D4	001-024052
Zener, 14V,1W	D5,D6	001-023026
Zener, 28V,1W	D7	001-023027
RESISTORS (Ohms)		
47		600-220171
1K		600-220491
10K		600-220731
5.6 2W		601-040061
82 10W		601-080241
100 10W		601-080211
200 10W		601-080221
50 20W		601-090231
CAPACITORS		
Electrolytic		
470 MFD, 35V		431-507359
1000 MFD, 15V		434-108159
2000 MFD, 50V		434-208509
Capacitor Clamp		013-049317
Shoulder Bushing		036-050835
Mica Insulator		036-050836
Heat Sink		041-050725

124-000393 PITCH MODULATOR

PWB (No Parts)		023-050758
TRANSISTORS		
Q1-Q4,Q6,Q8-Q13,Q15		
Q18-Q20,Q22,Q23,Q25,Q28		001-021134
Q7		001-021135
Q5,Q14,Q16,Q17,Q21,Q24		001-021173
DIODE		
D1-D19		001-226080
RESISTORS (Ohms)		
220		600-220331
1K		600-220491
2.2K		600-220571
4.7K 5%		600-220652
5.6K		600-220671
6.8K		600-220691
10K		600-220731
10K 5%		600-220732
15K		600-220771
18K 5%		600-220792
22K		600-220811
33K		600-220851
47K		600-220891
47K 5%		600-220892
56K		600-220911
100K		600-220971
100K 5%		600-220972
150K		600-221011
220K		600-221051
470K		600-221131
1.0M		600-221211
2.2M		600-221291
10K Trimmer Pot 1/8w		676-000064
100K Trimmer Pot 1/8w		676-000073
500K Trimmer Pot 1/8w		676-000080
CAPACITOR		
Mylar		
.022MFD		412-110482
.047MFD		412-110512
.01MFD		412-110522
.22MFD		412-110532
.33MFD		412-110552
.47MFD		412-110562
.056MFD		412-110622
Ceramic		
.0047MFD,500V		426-010663
.01MFD,500V		426-010743
Tantalum		
10MFD,15V		414-130152
15MFD,15V		414-130162
1.0MFD,35V		435-105352
Electrolytic		
4.7MFD,50V		431-056509
10MFD,50V		431-106509

124-000394 FILTER DRIVER BOARD

PWB (No Parts)		023-050765
TRANSISTORS		
Q1,Q2,Q4,Q7,Q10-Q12		
Q14-Q18		001-021134
Q3,Q5,Q6,Q8,Q9,Q13,Q19		001-021173
DIODES		
Signal		
D1-D18		001-226080
Zener 5V,1W		
D19		001-023030
INTEGRATED CIRCUIT		
IC-1		075-046287
OPERATIONAL AMPLIFIER		
OP1, OP2		075-000090
RESISTORS (Ohms)		
100		600-220251
150	5%	600-220292
470		600-220411
1K		600-220491
2.7K		600-220591
3.3K	5%	600-220612
4.7K		600-220651
10K		600-220731
10K	5%	600-220732
18K		600-220791
18K	5%	600-220792
22K		600-220811
39K		600-220871
47K		600-220891
47K	5%	600-220892
100K		600-220971
100K	5%	600-220972
120K	5%	600-220992
150K	5%	600-221012
220K		600-221051
220K	5%	600-221052
330K	5%	600-221092
1.0M		600-221211
1.2M	5%	600-221232
2.2M	5%	600-221292
5K Trimmer Pot 1/8W		676-000061
20K Trimmer Pot 1/8W		676-000065
250K Trimmer Pot 1/8W		676-000077
CAPACITORS		
Mylar		
.10 MFD		412-110522
.22 MFD		412-110532
Ceramic		
.001MFD, 500V		426-010502
Tantalum		
6.8 MFD, 35V		435-685352
Electrolytic		
100 MFD, 25V		431-107259

124-000395 LEGATO PULSE BOARD

PWB (NO PARTS)		023-050771
TRANSISTOR		
Q1, Q2,Q5-Q11,Q19		001-021134
Q3,Q4,Q12-Q18		001-021172
DIODE		
Signal		
D1-D5, D7-D13		0Q1-226080
Zener		
10V,1W D6		001-023039
RESISTOR		
820	5%	600-220472
1K		600-220491
4.7K		600-220651
4.7K	5%	600-220652
10K		600-220731
22K		600-220811
47K		600-220891
100K		600-220971
1K 1/4W	2%	628-210014
12K 1/4W	2%	628-212024
2K 1/4W	2%	628-220014
24K 1/4W	2%	628-224024
CAPACITORS		
Mylar		
.22 MFD		412-110532
Ceramic		
.0047 MFD, 500V		426-010663
.02 MFD, 500V		426-010763
Electrolytic		
22 MFD, 50V		431-256509
47 MFD, 25V		431-506259
100 MFD, 25V		431-107259

124-000396 KEYER BOARD

PWB (No Parts)		023-050800
TRANSISTOR		
Q1-Q6,Q15		001-021172
Q8, Q9		001-021134
Q7		001-021210
Q14		001-021135
Q10-Q13		001-021260-001
DIODE		
D1-D7		001-226080
RESISTORS (Ohms)		
100		600-220251
220		600-220331
1K		600-220491
2.7K		600-220591
4.7K		600-220651
6.8K		600-220691
8.2K		600-220711
10K		600-220731
15K		600-220771
22K		600-220811
39K		600-220871
47K		600-220891
100K		600-220971
150K		600-221011
220K		600-221051
270K		600-221071
390K		600-221111
470K		600-221131
820K		600-221191
1.0M		600-221211
5.6M		600-221391
5K Trimmer Pot 1/8W		676-000061
10K Trimmer Pot 1/8W		676-000064
20K Trimmer Pot 1/8W		676-000065
CAPACITOR		
Mylar		
.033MFD		412-110502
.10 MFD		412-110522
.22 MFD		412-110532
.47 MFD		412-110562
Ceramic		
.0001MFD, 500V		426-010252
.001 MFD, 500V		426-010502
.0022 MFD, 500V		426-010582
.02 MFD, 500V		426-010763
Electrolytic		
10 MFD, 50V		431-106509
100 MFD, 25V		431-107259
22 MFD, 50V		431-256509
47 MFD 25V		431-506259

124-000397 TONE PITCH BOARD

PWB (No Parts)		023-050810
RESISTORS (Ohms)		
100K		600-220971
CAPACITORS		
Ceramic		
.001 MFD, 500V		426-010503
SWITCH, SELECTOR		
S1		008-050715

124-000398 TONE FILTER BOARD

PWB (No Parts)		023-050811
RESISTORS (Ohms)		
30	5%	600-220122
51	5%	600-220182
56	5%	600-220192
110	5%	600-220262
150	5%	600-220292
560	5%	600-220432
10K	5%	600-220731
47K		600-220891
CAPACITOR		
Mylar		
.022 MFD		412-110482
.10 MFD		412-110522
Ceramic		
.0033 MFD, 500V		426-010622
.0022 MFD, 500V		426-010582
SWITCH, SELECTOR		
S1		008-050715

124-000399 FILTER WIDTH BOARD

PWB (No Parts)		023-050812
DIODES		
Signal D1-D6		001-226080
SWITCH, SELECTOR		
S1		008-050715

124-000400 FILTER SPEED BOARD

PWB (No Parts)		023-050813
DIODES		
Signal		
D1-D7		001-226080
RESISTORS (Ohms)		
680	5%	600-220452
12K	5%	600-220752
27K	5%	600-220832
100K		600-220971
120K	5%	600-220992
SWITCH, SELECTOR		
S1		008-050715

124-000402 PITCH SLIDE BOARD

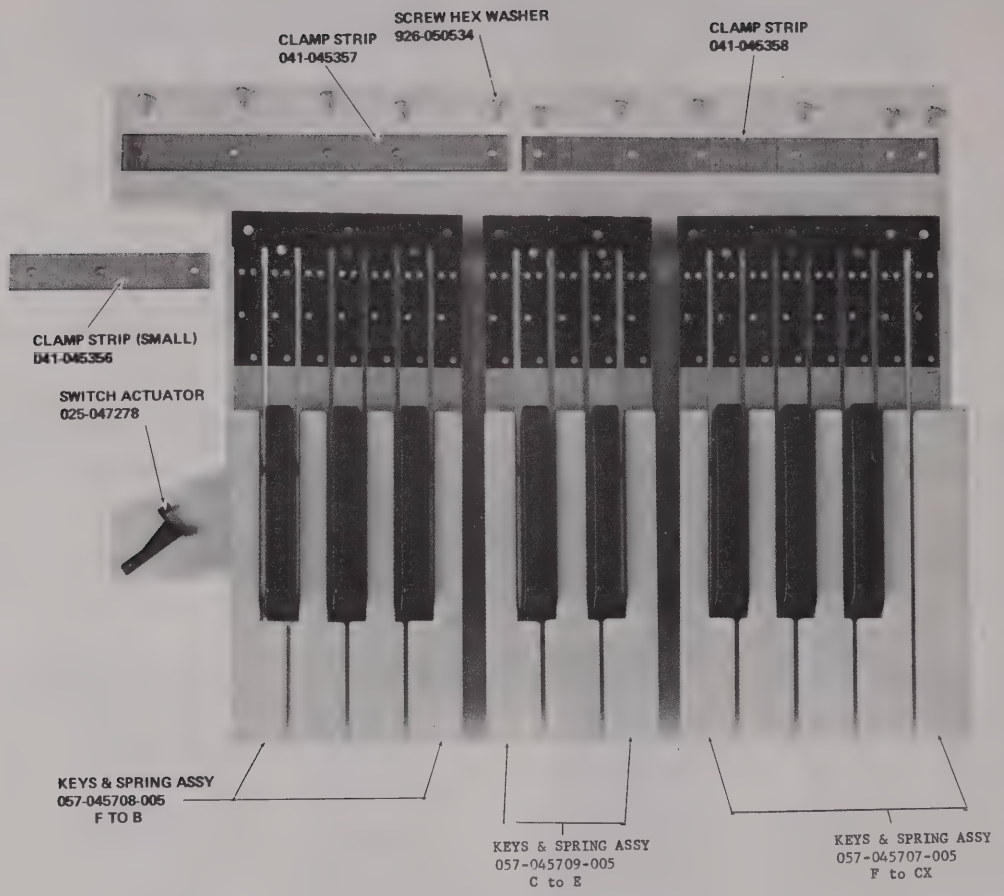
PWB (No Parts)		023-050815
DIODES		
Signal		
D1-D15		001-226080
SWITCH, SELECTOR		
S1		008-050715

124-000403 VIBRATO SWITCH BOARD

PWB (No Parts)		023-050816
DIODES		
Signal		
D1-D3, D5,D6		
D8-D10,D12-D16		001-226080
SWITCH, SELECTOR		
S1		008-050715

124-000401 ATTACK/DECAY BOARD

PWB (No Parts)		008-050715
DIODES		
Signal		
D1-D3		001-226080
SWITCH, SELECTOR		
S1		008-050715


SCREW HEX WASHER
926-050534
CLAMP STRIP
041-045357
CLAMP STRIP
041-045358
CLAMP STRIP (SMALL)
041-045356
SWITCH ACTUATOR
025-047278
KEYS & SPRING ASSY
057-045708-005
F TO B
KEYS & SPRING ASSY
057-045709-005
C to E
KEYS & SPRING ASSY
057-045707-005
F to CX

Hammond Service News

HAMMOND ORGAN COMPANY • A DIVISION OF HAMMOND CORPORATION • SERVICE DEPARTMENT

11610 Copenhagen Court • Franklin Park, Ill. 60131 312—766-6950

VOLUME 6 NUMBER 5

SEASONS GREETINGS --

To each and every one of our dealers, and their Service Personnel, we extend Holiday Greetings and wishes for a healthy and prosperous 1975.

SYNTHESIZER SERVICE MANUAL--

You will find enclosed a copy of the Synthesizer Service Manual, HO-1291. Additional copies are available upon receiving your order.

SYNTHESIZER AND AUTO-VARI 64 INSTALLATION INSTRUCTIONS

On the attached green sheets are the Installation Instructions that apply to both the Synthesizer and Auto Vari 64. These instructions cover a number of the older Models, as well as current Models. Both of these units are self contained and all that is required for installation is the connection of the Audio Output into the organ amplification system. The A.C. line cord can be plugged into any convenient 117 volt A.C. outlet.

CONCORDE TEST & ADJUSTMENT PROCEDURE

The test and adjustment procedure enclosed is for the early Concorde Models prior to Serial Number 376837. This information should be added to your current Concorde Service Manual HO-1275.

MANY THANKS --

To Mr. Walter Hastings, Hammond Service Center, Philadelphia, Pa. for his service tip contributions and to Zippo, Moeller Music, Zanesville, Ohio, for the one he contributed. All three of these are enclosed in the attached green sheets. We appreciate receiving any and all service tips, especially those that may be unusual, so that we can publish them for the benefit of other technicians.

SERVICE SCHOOL NOTES --

The attendance at the Service Schools have continued to be tremondous. We have received many more requests for reservations than we had space available. We do want to thank you dealers and technicians for this enthusiatic response. This certainly will help provide better service to your customers.

The Service School Schedule for 1975 is not available at this time, but is expected to be finalized and released in January. Watch for the next Service News for this information.

The following men attended the Basic Service School beginning September 30, 1974.

Steven Bryan	Worthington,Ohio
Chuck Beamer,	Franklin Park,Ill.
Richard Cooper	Wausau, Wis.
Chester Cunningham	Springfield, Mo.
George Ellefsen	Spokane, Wash.

Lyle C. Felix	Appleton, Wis.
Charles Forsch	Painesville, Ohio
Lennox Heilmann	Beaumont, Tex
Fred C. Kirkby	Traverse City,Mich.
Ron Martinez	Lawton, Okla
David G.Miller	Dayton, Ohio
Larry J. Moore	Greenwood, S.C.
John Nichols	Memphis, Tenn.
Robert Reist	Kalamazoo, Mich.
Chester Smith	Spokane, Wash.
Jan L. Troost	Ft. Wayne, Ind.

The following men attended the Intermediate Service School beginning October 21, 1974

Warren Axtell	Bellevue, Wash.
Walter Bagley	Fayetteville, N.C.
Thomas Barclay	San Diego, Calif.
James Baturoni	Dearborn, Mich.
Samuel Bowers	Kansas City, Mo.
Charles Burke	E.Liverpool, Oh
Mike Dillon	Kansas City, Mo.
Bobby Elmore	Louisville, Ky.
John A. Faison	San Angelo, Tex.
Gregory Huszai	Cleveland, Ohio
Ambrose Jackson	Elizabeth, N.J.
Irvin G. Kanode	Elkhart, Ind.
Albert Kent	Albuquerque,N.M.
James T. Lukas	Dearborn, Mich.
Larry Moore	Greenwood, S.C.
Lloyd Mosier	Bloomington, Ind.
Michael Price	Birmingham,Ala.
Les J. Record	Lubbock, Texas
Tom Richerson	Memphis, Tenn.
Robert Service	Covina, Calif.
Larry Wade	Gadsden, Ala.

HAMMOND ORGAN COMPANY

DIVISION OF HAMMOND CORPORATION

ATTENTION ALL DEALERS AND SERVICE TECHNICIANS

Two Hammond Organs have been reported to us as being stolen. If you have any information concerning these organs, please contact the owners or the dealers in the area.

The first is: Model B-3, Serial D189110 owned by Mr. Edward J. Pate, Jr., 3809 River Oaks Lane, Louisville, Kentucky. The dealer in the area is Shackleton Piano Co., 621 South Fourth, Louisville, Kentucky, 40202, telephone 502/583-8811.

The second is: Model B-3, Serial 100651 with a Model 142 Leslie Tone Cabinet, Serial 03220. The owner is Mr. Allen Friedman, 25300 Rockside Road, Rockside Park Towers, B721, Bedford Heights, Ohio, 44146. The dealer in the area is Hammond Organ Studios of Cleveland East, 5160 Wilson Mills Road, Richmond Heights, Ohio 44130.

Model AS INDICATED IN FOLLOWING INFORMATION

SUBJECT: INTALLATION INSTRUCTIONS FOR SYNTHESIZER AND AUTO VARI 64 ACCESSORY UNITS.

The following instructions apply to the installation of either the Synthesizer or Auto Vari 64 Accessory Units. Most Organ Models are covered in this information, other and new Models will be presented as information becomes available.

1. A good quality shielded Audio Cable is needed for interconnecting Accessory Unit to Organ. The cable end to be inserted into the Accessory Unit should carry a standard 1/4" Phone Plug. The other cable end, depending on Organ Model and the method used, will either carry an R.C.A. type Phone Plug to match receptacle for direct plug in, or striped cable leads for direct solder connections.

2. Two methods of installation for each Model is available.

   (a) No Expression: The volume of the Accessory used will remain constant and will not be fluctuated by the action of the organ Expression Pedal.

   (b) WITH EXPRESSION: The volume of the Accessory Unit used will fluctuate with the organ as the Expression Pedal is activated.

3. See Sheet 3 and 3 for Model and Method of Installation.

INSTALLATION INSTRUCTIONS FOR SYNTHESIZER & AUTO VARI 64 ACCESSORY UNITS

MODEL	CABLE FROM OUTPUT OF ACCESSORY	CONNECT CABLE LEAD	CONNECT SHIELD OF CABLE	ADJUST ACCESSORY OUTPUT CONTROL (POT)
T-500 NO EXPRESSION	Through 47 K OHM Resistor	Connect to Pin 12 on the 124-000176 Bd.	To nearest ground	Adjust for 3/4 rotation
WITH EXPRESSION	Thru 47 K OHM Resistor and a 0.1 MFD in series.	To Pin 4 on 124-000014 Bd.	To nearest ground	Adjust for 1/2 rotation
1100 PHOENIX NO EXPRESSION	Connect cable	To Pin 17 (from Reverb) on 124-000267 Board	To nearest ground	Adjust for 1/2 rotation
WITH EXPRESSION	Connect cable	To Pin 14(Main in) On 124-002267 Bd.	To nearest ground	Adjust for 1/2 rotation
7100 COUGAR NO EXPRESSION	Connect cable to the Phone Jack on Power Amp. Chassis 126-000095			Adjust for 1/4 rotation
WITH EXPRESSION	Connect cable	To Pin 4 of J-20 on 124-000272-001	To nearest ground	Adjust for 1/4 rotation
8200 NO EXPRESSION	Connect cable to the Phono Jack on Power Amplifier Chassis 126-000094			Adjust for 1/4 rotation
WITH EXPRESSION	Connect cable	To Pin 19 of J-106 on 124-000208 Bd.	To nearest ground	(a) on Bd. 124-000208 adjust pot. R-44) synthesis to maximum. (b) Adjust accessory output pot. to 3/4 rotation.

INSTALLATION INSTRUCTIONS FOR SYNTHESIZER & AUTO VARI 64 ACCESSORY UNITS

MODEL	CABLE FROM OUTPUT OF ACCESSORY	CONNECT CABLE LEAD	CONNECT SHIELD OF CABLE	ADJUST ACCESSORY OUTPUT CONTROL (POT)
2100 CONCORDE NO EXPRESSION	Connect cable to Phono input Jack on Power Amp. Chassis 126-000079			Adjust for 1/4 rotation
WITH EXPRESSION	Connect Cable	To Pin 11 of J-144 on 124-000374 Bd.	To nearest ground	Adjust for 3/4 rotation
4000 REGENT NO EXPRESSION	Connect cable to Phono Jack on Power Amp. Chassis 126-000094			Adjust for 1/4 rotation
WITH EXPRESSION	Connect cable	To Pin 19 of J-106 on 124-000208 Bd.	To nearest ground	(a) On Bd. 124-000208 adjust potentiometer (R-44) Synthesis to maximum (b) Adjust Accessory output pot. to 3/4 rotation.
MODELS A,B,C SERIES NO EXPRESSION	Connect cable to the Phono input Jack located on the Expression Control Capacitor Enclosure on the Pre-Amplifier Chassis.			Adjust for 1/3 rotation
WITH EXPRESSION	Connect cable through 100 PF capacitor to terminal "D" on Pre-Amplifier Chassis		To nearest ground	Adjust to near maximum
X-66 NO EXPRESSION	Connect to Microphone input Jack on Organ Control Panel			Adjust for 1/4 rotation
WITH EXPRESSION	Connect through 47K OHM Resistor to	Locate on Expression Pre-Amp Bd. AO-32299-1 terminals W25, 26, & 27. Now connect cable to junction of the 56K, 22K and 330K Resistors in that area.	To nearest ground	Adjust for maximum rotation.

Hammond Service News Volume 6 Number 5

NOVEMBER 1974

Model PHOENIX
1100

SUBJECT: BUZZ PICK UP IN REVERBERATION UNIT

CORRECTION: When flourescent lights are present in room in which organ is located, a buzz can be picked up by the circuits on the Reverberation Board (124-000166) located on back of Reverb Unit. Install shield over the Reverberation Board making sure it is well grounded. This same problem could occur on other Models using the same reverberation assembly.

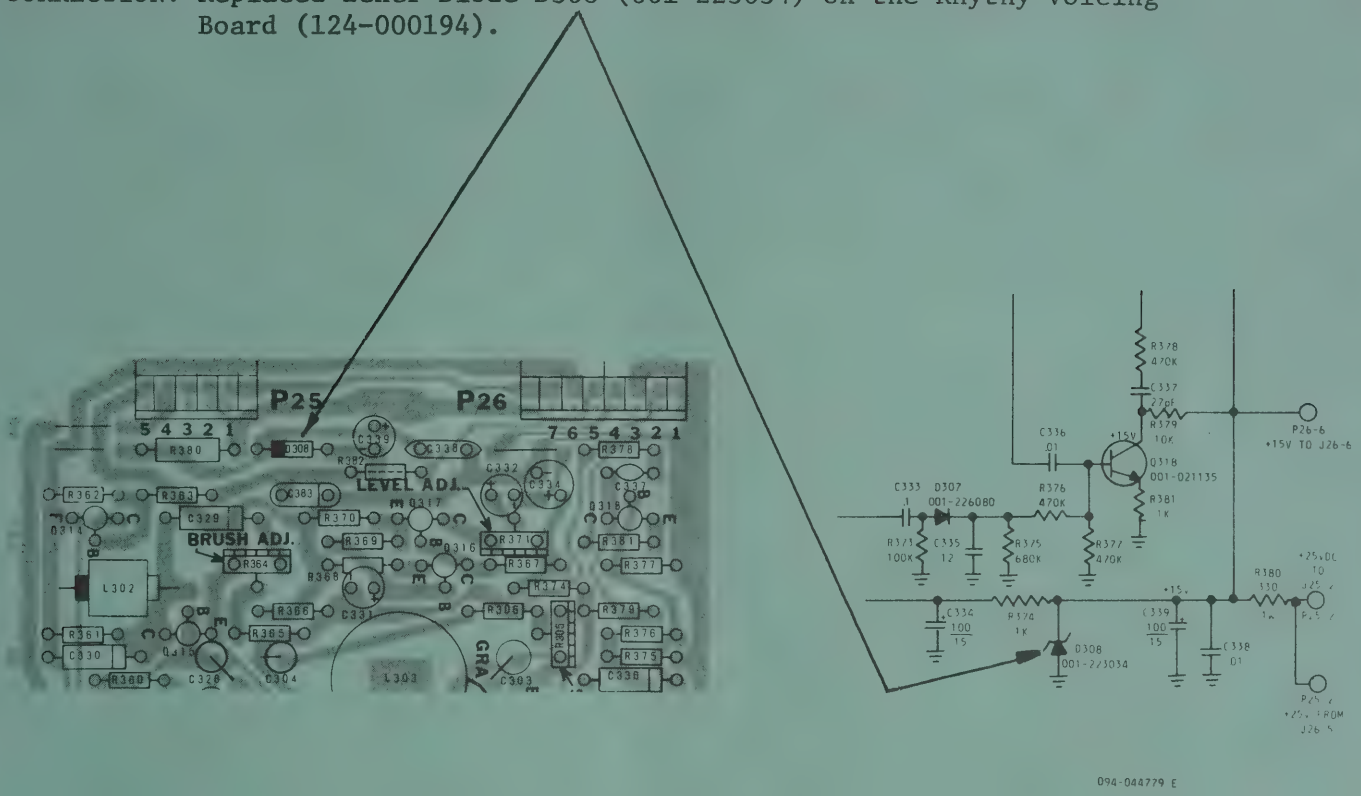
Hammond Service News Volume 6 Number 5

NOVEMBER 1974

Model MAVERICK 5200

SUBJECT: NO RHYTHM VOICES. TEMPO LAMP AND AUTO CHORD OK.

CORRECTION: Replaced Zener Diode D308 (001-223034) on the Rhythy Voicing Board (124-000194).

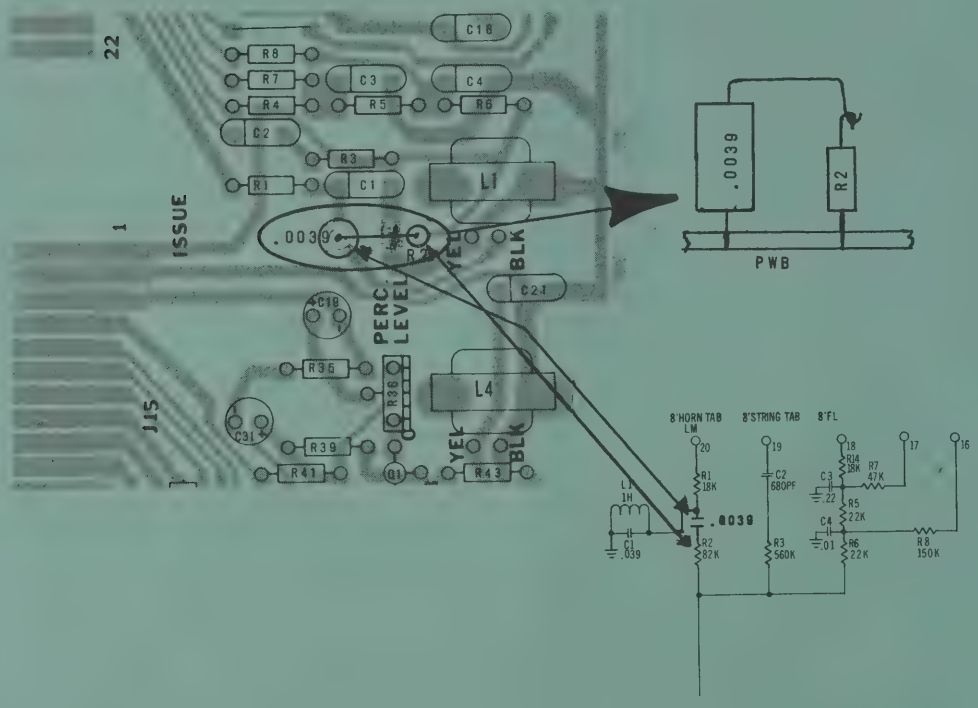


MODEL MAVERICK
5200

SUBJECT: HUM WITH TREMOLO SLOW/FAST SWITCH IN SLOW POSITION

CORRECTION: Install a .0039 MFD Mylar Capacitor in series with R2, 82K resistor as shown below on the 124-000273 Filter Board.

The added capacitor attenuates low frequencies being picked up by coil L1 in the Lower Manual Horn Filter.



Hammond Service News Volume 6 Number 5

NOVEMBER 1974

Model 2100 SERIES
CONCORDE SERVICE
MANUAL

SUBJECT: "EARLY UNITS" INFORMATION ADDED TO TEST AND ADJUSTMENT PROCEDURE

The following information should be added to the test and adjustment procedures in Section II of your current Concorde Service Manual:

The Procedure does not indicate reading and adjustments for Units made below Serial #376837. These organs will be called "Early Units", and the following information should be added in the proper boxes in procedure.

AT STEP 2, Add-Adjust "Early Units" - 2.5 volts R.M.S.

STEP 4, Add-Adjust "Early Units" - 110 to 160 M.F.

STEP 5, Add-"Early Units", Lower Manual and Pedal Null Adjust.

(a) Adjust R-23 - Acc Null (124-000210) Board
(b) Listening
Extend Pedal Tone #1 (only)
No Pedal Depressed
Adjust R-48, 16' Null (124-000210) Board
To Minimum Audible Thump.
(c) Listening
Extend Tone Bar #2 (only)
No Pedal Depressed
Adjust R-91 - 8' Null (124-000210) Board

STEP 6, Add and a Correction

Serial #376837 and above.
Adjust R1 On 124-000360 Board to 3.0 volts R.M.S.
Early Units
Adjust R-13 on 124-000210 Board to 2.5 Volts R.M.S.

STEP 8 - Add

(a) "Early Units" - Adjust to 3.4 Volts R.M.S.
(b) "Early Units" - Minimum Expression - 150 to 200 M.V.

STEP 9, Add-"Early Units". Adjust to .9 volts R.M.S.

STEP 14, Add-"Early Units"
Adjust, R-42 on 124-000211 Board to 10 volts R.M.S.

Hammond Service News Volume 6 Number 5

NOVEMBER 1974

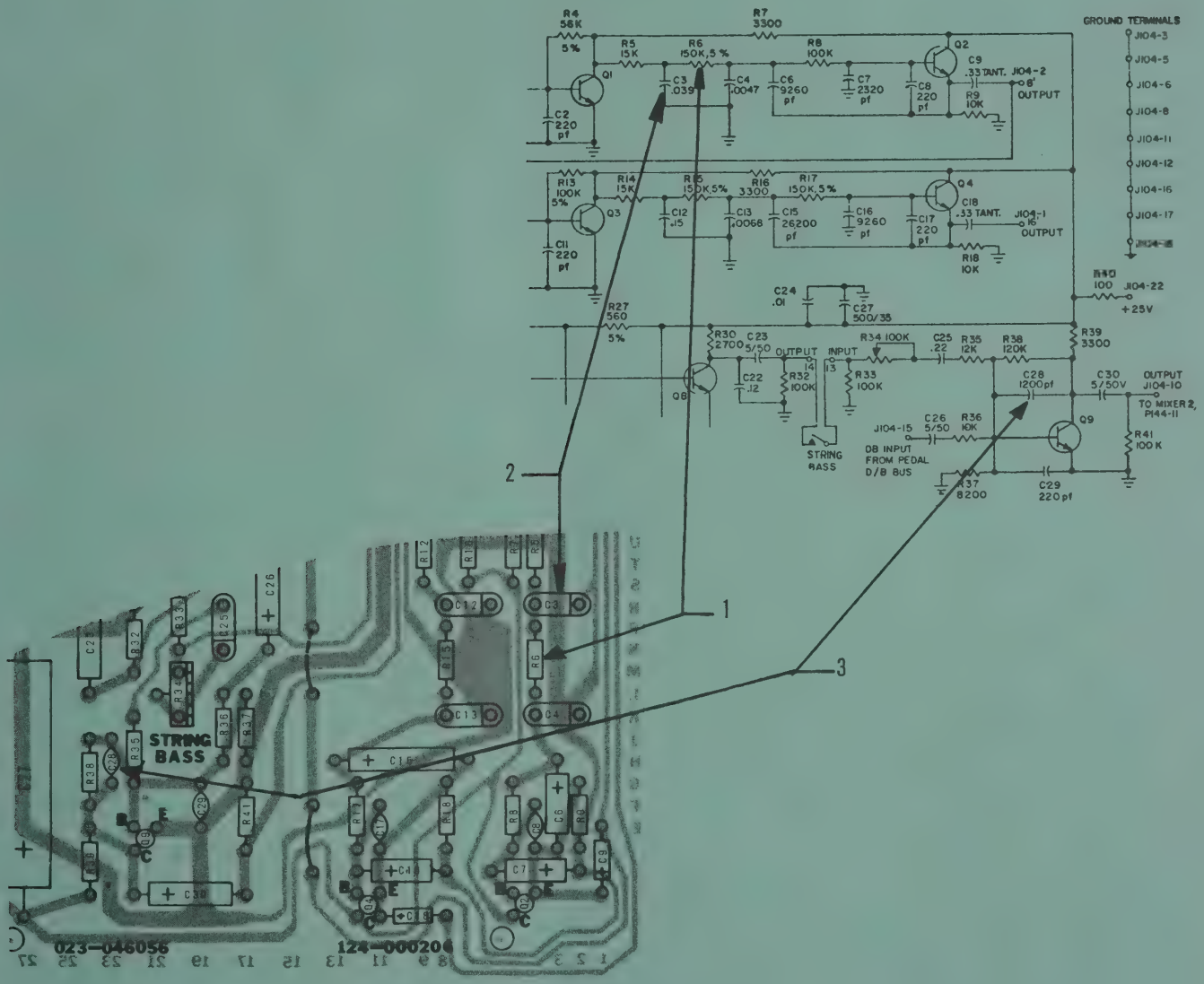
Model CONCORDE
2100

SUBJECT: CLICK AND POP WHEN ADJUSTING PEDAL DRAWBARS

CORRECTION: Make the following changes on the Pedal Filter Board (124-000206).

1. Change R6 from 150K, 5% to 33K, 5%.
2. Change C3 from .039 MFD to .01 MFD.
3. Change C28 from 1200 PF to .02 MFD.

The capacitors should be ± 10% Ceramic or Mylar.

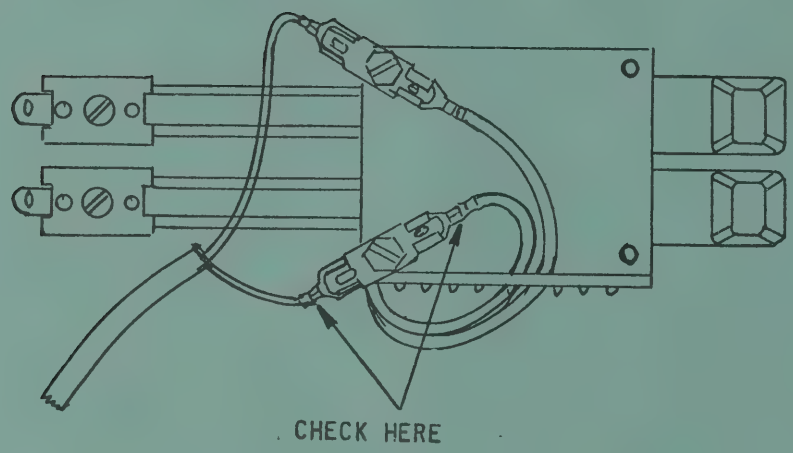


MODEL: CONCORDE
2100

SUBJECT: PEDALS PLAY AT LOUD VOLUME WITH DRAWBARS OFF

CORRECTION: Check for poor ground connections at the terminal on top of the pedal drawbar assembly.

See sketch below for location.



Hammond Service News Volume 6 Number 5

NOVEMBER 1974

Model 2100

SUBJECT: 2100 SERIES CONCORDE SERVICE MANUAL

Component missing on Schematic Drawing. On Page 3-34, Figure 3-33 lower left hand area of Schematic, note or draw in Diode "D-13" as indicated in section of Schematic below.

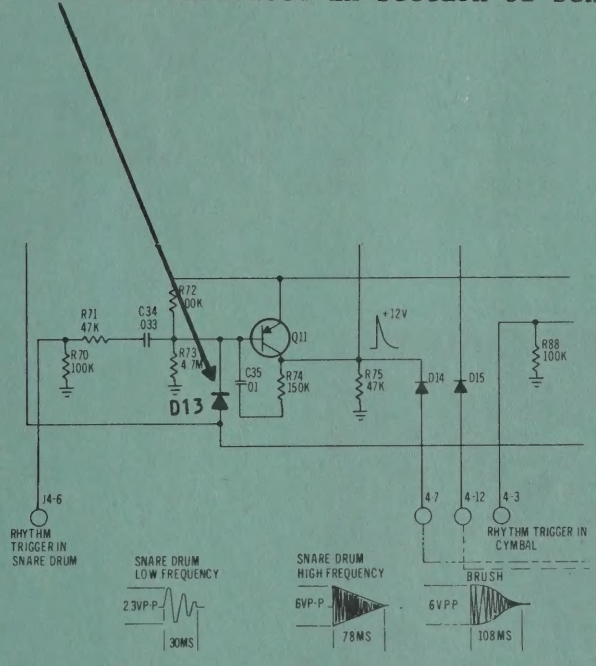
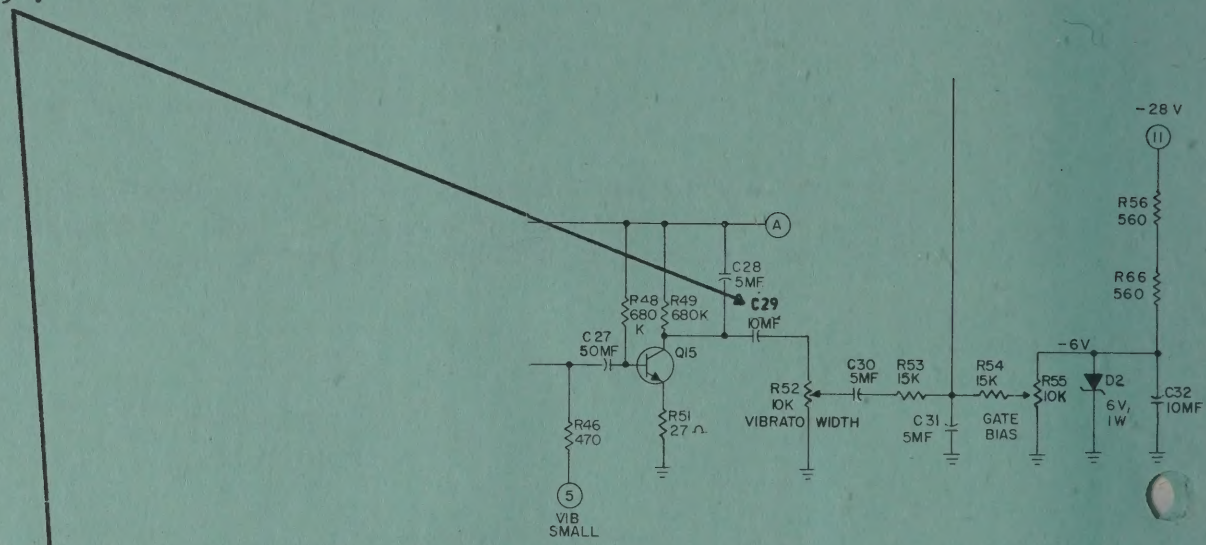
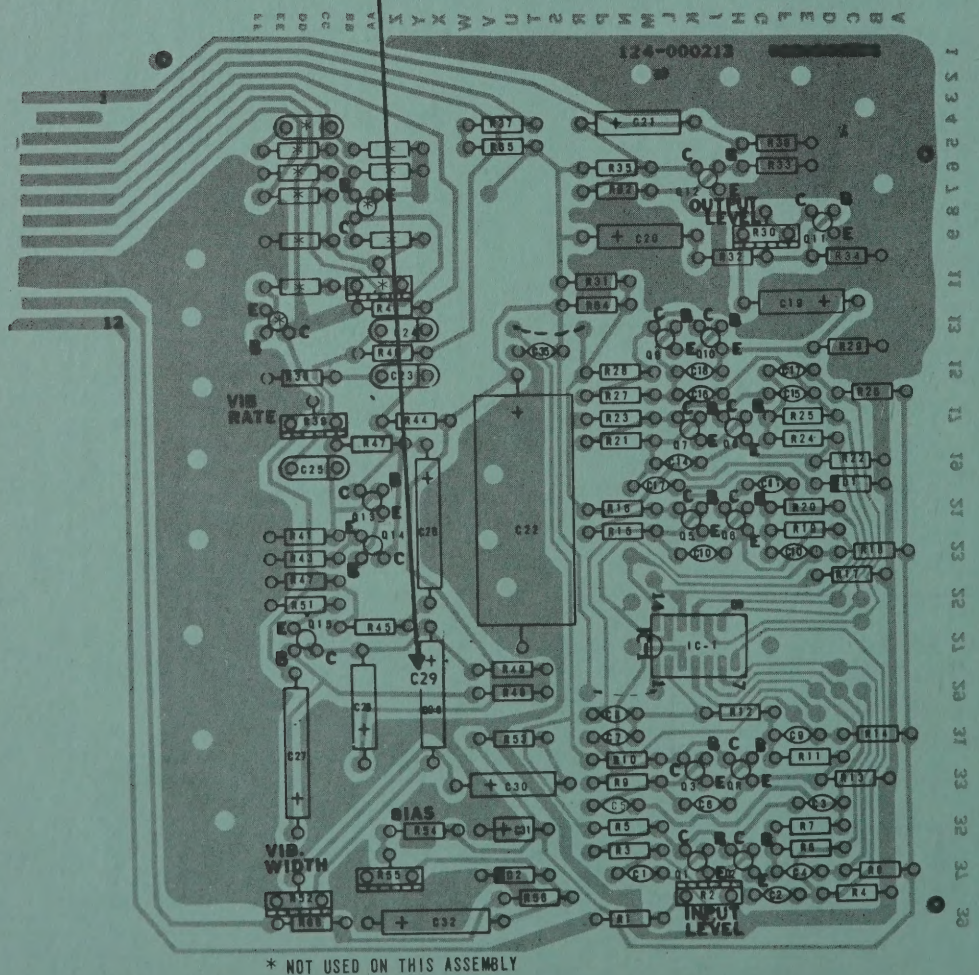


FIGURE 3-33
RHYTHM VOICING BOARD
SCHEMATIC, AND LAYOUT
(124-000180)

SUBJECT: 2100 SERIES CONCORDE SERVICE MANUAL Model 2100

Component call out in error, on Page 3-27, Figure 3-26. Correct Legend and Schematic as indicated below. Both capacitors shown should be "C-29".





124-000213

094-046349-D

* NOT USED ON THIS ASSEMBLY

Hammond Service News Volume 6 Number 5

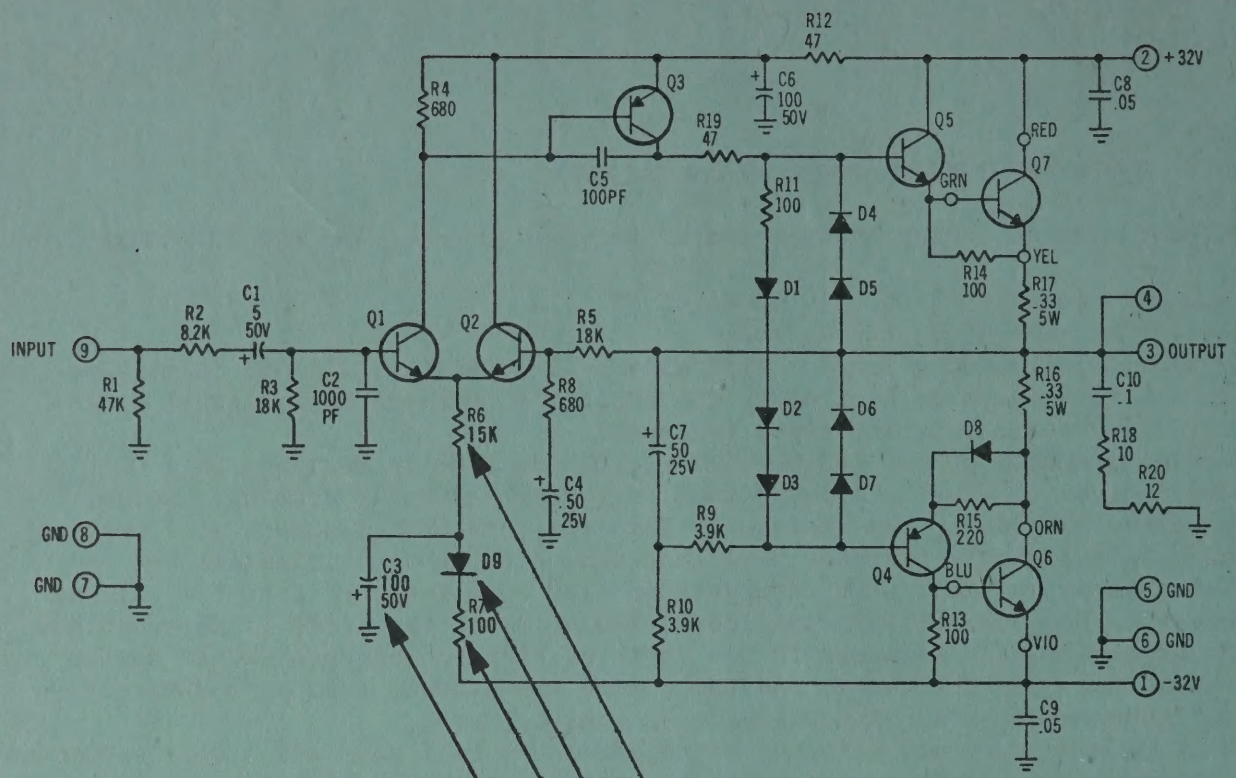
NOVEMBER 1974

Model 35 WATT
POWER AMP

SUBJECT: POWER AMP TURN-ON THUMP MINIMIZATION

CORRECTION: The following changes are to be made in Power Amp PWB 124-000169.

1. Remove R6 (6.8K), R7 (6.8K), C3 (5 uf/50 V).
2. Replace R6 with 15 K, 1/2 W, 10%.
3. Replace C3 with 100 uf/50 V. Typically this capacitor, will be larger, so leads will have to be bent under the capacitor to reach the original holes for C3. Observe polarity stays the same.
4. Make an assembly of the 100 Ohm 1/2 W, 10% resistor in series with a 001-026080 diode - refer to illustration on the PWB assembly drawing. Solder the diode cathode to the resistor. This two component assembly will replace the original single resistor (R7) that was on the board. Install the resistor-diode assembly with the resistor (100 ohm) inserted into the hole adjacent to C10, the 0.1 uf capacitor. The anode of the diode is inserted into the remaining hole adjacent to D7. Both of these components should now be perpendicular to the board, and the connection between them approximately 1/2" above the board. See Figure I on reversed side.
5. Check to make sure all connections soldered - 6 foil pads and 1 wire connection.
6. Test power amp in organ - no audible change in musical qualities should be noted. Turn on and turn off thump due to power amp are now minimized. Any thump remaining is due to circuits before the power amp.


R12
47
+32V
R4
680
Q3
C6
100
50V
C8
.05
R19
47
Q5
RED
C5
100PF
Q7
GRN
R11
100
D4
YEL
R14
100
D1
D5
R17
.33
5W
C1
5
50V
R2
8.2K
Q1
Q2
R5
18K
INPUT
OUTPUT
R1
47K
R3
18K
C2
1000
PF
R8
680
R16
.33
5W
C10
.1
D2
D6
D8
R6
15K
C7
50
25V
R18
10
R20
12
D3
D7
C4
.50
25V
R15
220
ORN
R9
3.9K
GND
GND
C3
100
50V
D9
Q4
Q6
BLU
R7
100
R10
3.9K
R13
100
VIO
GND
GND
-32V
C9
.05

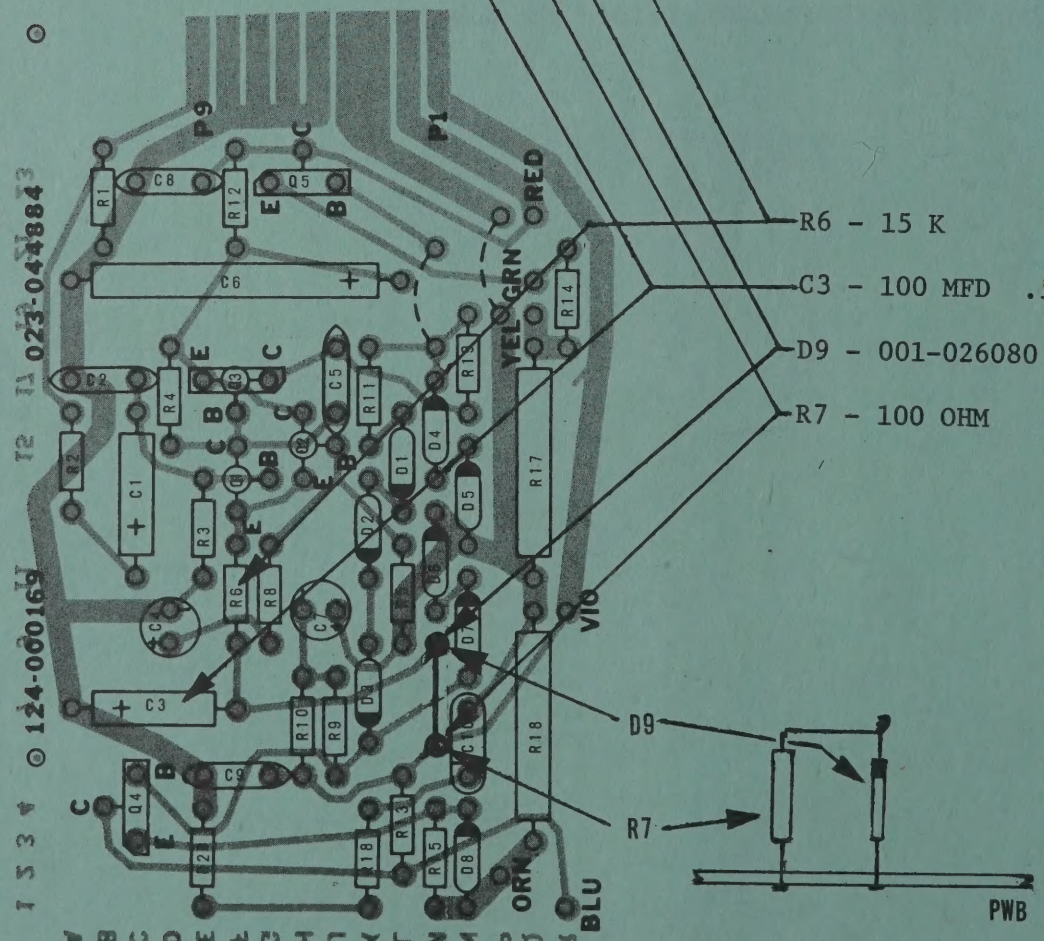

P9
P1
R6 - 15 K
C3 - 100 MFD .50 V
D9 - 001-026080
R7 - 100 OHM
D9
R7
PWB
YEL
GRN
ORED
VIO
ORN
BLU
023-044884
124-000169

FIGURE I